VOLUME 7 PART 3

NORTH AMERICAN FLORA

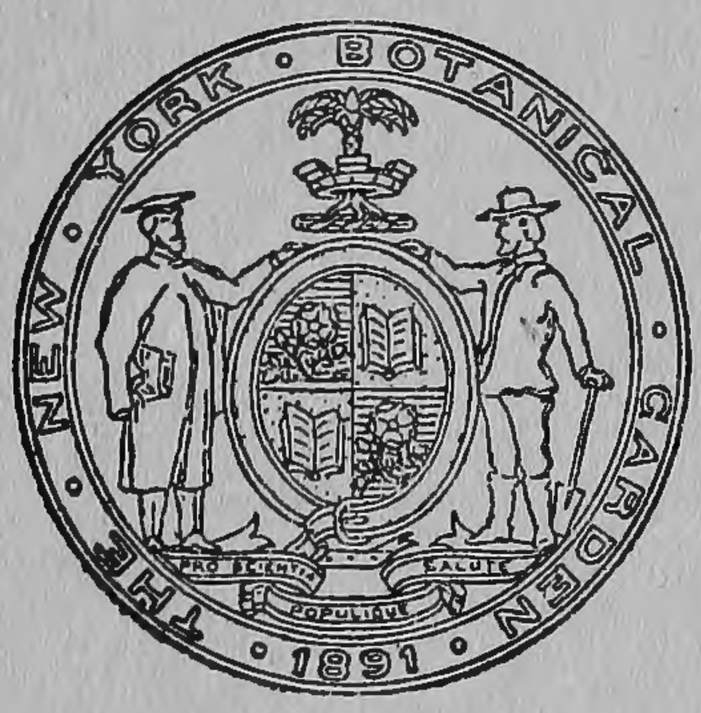
(UREDINALES)

AECIDIACEAE (continuatio)

JOSEPH CHARLES ARTHUR

GYMNOSPORANGIUM

FRANK DUNN KERN



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ANNOUNCEMENT

The NORTH AMERICAN FLORA is designed to present in one work descriptions of all plants growing, independent of cultivation, in North America, here taken to include Greenland, Central America, the Republic of Panama, and the West Indies, except Trinidad, Tobago, and Curaçao and other islands off the north coast of Venezuela, whose flora is essentially South American.

The work will be published in parts at irregular intervals, by the New York Botanical Garden, through the aid of the income of the David Lydig Fund bequeathed by Charles P. Daly.

It is planned to issue parts as rapidly as they can be prepared, the extent of the work making it possible to commence publication at any number of points. The completed work will form a series of volumes with the following sequence:

Volume 1. Mycetozoa, Schizophyta, Diatomaceae.

Volumes 2 to 10. Fungi.

Volumes 11 to 13. Algae.

Volumes 14 and 15. Bryophyta.

Volume 16. Pteridophyta and Gymnospermae.

Volumes 17 to 19. Monocotyledones.

Volumes 20 to 32. Dicotyledones.

The preparation of the work has been referred by the Scientific Directors of the Garden to a committee consisting of Dr. N. L. Britton, Dr. W. A. Murrill, and Dr. J. H. Barnhart.

Professor George F. Atkinson, of Cornell University; Professor John M. Coulter, of the University of Chicago; Mr. Frederick V. Coville, of the United States Department of Agriculture; Professor Edward L. Greene, of the United States National Museum; Professor Byron D. Halsted, of Rutgers College; and Professor William Trelease, of the Missouri Botanical Garden, have consented to act as an advisory committee.

Each author will be wholly responsible for his own contributions, being restricted only by the general style adopted for the work, which must vary somewhat in the treatment of diverse groups.

The subscription price is fixed at $1.50 for each part; it is expected that four or five parts will be required for each volume. A limited number of separate parts will be sold at $2.00 each. Address:

THE NEW YORK BOTANICAL GARDEN

BRONX PARK

NEW YORK CITY

II. Uredinia hypophyllous, or somewhat amphigenous, more or less gregarious, roundish, small or minute, early naked, cinnamon-brown, ruptured cuticle inconspicuous; paraphyses peripheral, hyphoid, somewhat bent, 5–9 by 40–50 μ, the wall thin, colorless, smooth; urediniospores broadly obovoid or globoid, 18–22 by 20–25 μ; wall golden-yellow, rather thin, 1–2 μ, sparsely and evenly verrucose, the pores indistinct, 2, opposite and equatorial.

III. Telia chiefly hypophyllous, resembling the uredinia, but blackish and with fewer paraphyses; teliospores elliptical, 26–29 by 33–38 μ, rounded at both ends, which become depressed in drying, slightly constricted at the septum; wall dark cinnamon-brown, thick, 3–4 μ, gelatinous layer golden-yellow, inconspicuous, rather densely and prominently verrucose with slender papillae; pedicel nearly colorless except near the spore, delicate, once to once and half length of spore, with one or two irregular whorls of small, somewhat branched appendages near the base.

ON BIGNONIACEAE:
Amphilophium molle Cham. & Schlecht., Mexico.
Pithecoctenium hexagonum DC., Morelos.
TYPE LOCALITY: Cuernavaca, Morelos, on "*Amphilophium*," error for *Pithecoctenium hexagonum*.
DISTRIBUTION: Central Mexico.
EXSICCATI: Vesterg. Micr. Rar. Sel. *1125*.

3. **Prospodium tuberculatum** (Speg.) Arthur.*

Uredo tuberculata Speg. Anal. Soc. Ci. Argent. 9: 172. 1880.
Puccinia tuberculata Speg. Anal. Soc. Ci. Argent. 10: 6. 1880.

O. Pycnia unknown.

II. Uredinia chiefly hypophyllous, scattered, orbicular, 0.3–0.5 mm. across, early naked, pulverulent, pulvinate, cinnamon-brown, ruptured cuticle inconspicuous; paraphyses peripheral, cylindrical, straight, not exceeding the spore-mass, 9–12 by 27–35μ, the wall colorless, uniformly thin, 1 μ, smooth; urediniospores obovate-globoid, 23–26 by 24–29 μ; wall obscurely lamellate, golden-brown, moderately thick, 2–3 μ, sparsely and evenly echinulate with points 3–4 μ apart, the pores 2, opposite and equatorial.

III. Telia usually amphigenous, scattered, often crowded, irregularly orbicular, 0.3–0.7 mm. across, early naked, velvety and somewhat pulverulent, dark chocolate-brown, ruptured cuticle usually inconspicuous; teliospores ellipsoid, 29–35 by 40–48 μ, rounded at both ends, slightly or not constricted at the septum; wall chocolate-brown, gelatinous layer inconspicuous, prominently verrucose with bead-like papillae, almost evenly thick, 3–6 μ, slightly thicker at apex, 5–8 μ, with a small, lighter-colored umbo; pedicel nearly or quite colorless, somewhat fragile, 9–10 μ in diameter, once to once and half length of spore, with one or two irregular whorls of small, somewhat branched appendages near the base.

ON VERBENACEAE:
Lantana horrida H.B.K., Jalisco, Morelos.
TYPE LOCALITY: Recoleta, Argentina, on *Lantana Camara*.
DISTRIBUTION: Central Mexico; also in South America.

4. **Prospodium Lippiae** (Speg.) Arthur.

Puccinia Lippiae Speg. Anal. Mus. Nac. Buenos Aires 6: 224. 1898.
Uredo Lippiae Speg. Anal. Mus. Nac. Buenos Aires 6: 238. 1898.
Uredo Lippiae Dietel & Holway; Holway, Bot. Gaz. 31: 335. 1901.

O. Pycnia unknown.

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*The following key to species of *Prospodium* should be substituted for the one on the preceding page:

Paraphyses free.	
Urediniospore-wall inflated; teliosporic appendages large.	1. *P. appendiculatum*.
Urediniospore-wall not noticeably inflated.	
Teliosporic appendages small.	2. *P. Amphilophii*.
Teliosporic appendages large.	
Appendages in 1 or 2 whorls.	3. *P. tuberculatum*.
Appendages in 4 or more whorls.	4. *P. Lippiae*.
Paraphyses united at the base into a cup.	
Urediniospore-wall inflated; teliosporic appendages small.	5. *P. plagiopus*.
Urediniospore-wall not noticeably inflated; teliosporic appendages large.	6. *P. bahamense*.

II. Uredinia hypophyllous, scattered, sometimes crowded, orbicular, small, 0.1–0.2 mm. across, early naked, pulverulent, cinnamon-brown, ruptured cuticle inconspicuous; paraphyses peripheral, cylindrical or slightly clavate, straight, not exceeding the spore-mass, 8–13 by 30–45 μ, the wall colorless, uniformly thin, 1 μ, smooth; urediniospores globoid, or slightly depressed-globoid, 23–27 μ in diameter; wall golden-brown, 2–2.5 μ, often noticeably thinner in vicinity of the pores, rather densely and evenly verrucose-echinulate with points 2–3 μ apart, the pores 2, opposite and equatorial.

III. Telia usually amphigenous, scattered, small, 0.1–0.5 mm. across, early naked, dark chocolate-brown or blackish, ruptured cuticle inconspicuous; teliospores ellipsoid, 28–33 by 39–42 μ, rounded at both ends, slightly or not constricted at the septum; wall dark chocolate-brown, usually dense, strongly and closely verrucose, thick, 5–7 μ, slightly thicker at the apex, 7–10 μ, with a small, lighter-colored umbo; pedicel colorless, once to once and half length of spore, with 3 or 4 whorls of large, much branched appendages near the base.

ON VERBENACEAE:
Lippia callicarpaefolia H.B.K., Morelos.
Lippia myriocephala Schlecht. & Cham., Guatemala.
Lippia Pringlei Briq., Guerrero, Oaxaca.
Lippia sp., Jalisco.
TYPE LOCALITY: La Plata, Argentina, on *Lippia lycioides*.
DISTRIBUTION: Central Mexico southward into Central America; also in South America.

5. **Prospodium plagiopus** (Mont.) Arthur.

Puccinia plagiopus Mont. Pl. Cell. Cuba 294. 1842.

O. Pycnia unknown.

II. Uredinia hypophyllous, scattered, often crowded, minute, roundish, 0.1 mm. or less across, early naked, chocolate-brown, ruptured cuticle not noticeable; paraphyses numerous, peripheral, united at the bases, terete, 5–6 by 55–67 μ, acuminate, slightly incurved, often somewhat wavy, the wall firm, about 2 μ thick, chestnut-brown, smooth; urediniospores globoid, 26–34 μ in diameter; wall laminate, inner layer cinnamon-brown, 2–2.5 μ thick, outer layer paler, gelatinous, swelling in water up to 3–4 μ, rather sparsely and coarsely verrucose with blunt conical papillae, the pores rather distinct, 2, opposite and equatorial.

III. Telia at first arising from the uredinia; paraphyses similar to those in the uredinia; teliospores broadly ellipsoid, 30–37 by 40–50 μ, slightly or not constricted at the septum, rounded both above and below; wall cinnamon- to chestnut-brown, 4–6 μ thick, gelatinous layer inconspicuous, sparsely verrucose with blunt conical papillae; pedicel nearly colorless, one half to once length of spore, with one or two irregular whorls of small, somewhat branched appendages near the base.

ON BIGNONIACEAE:
Tecoma lepidota (H.B.K.) DC., Cuba.
TYPE LOCALITY: San Marcos, Cuba, on unknown plant [*Tecoma lepidota*].
DISTRIBUTION: Central and western Cuba.
ILLUSTRATIONS: Mont. Pl. Cell. Cuba *pl. 11, f. 1*; Sydow, Monog. Ured. 1: *pl. 23, f. 330*.

6. **Prospodium bahamense** Arth. Bull. Torrey Club **34**: 587. 1908.

O. Pycnia unknown.

II. Urediniospores intermixed with the teliospores, few seen, broadly ellipsoid or globoid, 18–23 by 24–27 μ; wall golden-brown, not noticeably laminate, moderately thick, 2.5–3 μ, sparsely and strongly verrucose, the pores 2, opposite and equatorial.

III. Telia hypophyllous, minute, scattered or often crowded into seemingly pulvinate groups 0.2–1 mm. across, early naked, blackish, ruptured cuticle not noticeable; paraphyses numerous, peripheral, united at the bases, terete, 9–10 by 55–64 μ, acuminate, somewhat incurved, the wall firm, about 2 μ thick, dark chestnut-brown, smooth; teliospores few in a sorus, broadly ellipsoid, 24–27 by 32–39 μ, rounded at both ends, slightly constricted at the septum; wall chocolate-brown, rather thick, 3.5–4.5 μ, gelatinous layer golden-yellow, not conspicuous except at apex and sometimes at base where it produces an umbo-like thickening 2–3 μ, closely and rather coarsely verrucose; pedicel pale amber-colored through-

out, once to once and a half length of spore, with one whorl of rather large, much-branched appendages, near the base.

ON BIGNONIACEAE:
Tecoma Leucoxylon (L.) Mart. (*T. bahamensis* Northrop), Bahamas.
TYPE LOCALITY: New Providence, Bahamas, on *Tecoma bahamensis*.
DISTRIBUTION: Known only from the type locality.

15. **NEPHLYCTIS** Arth. Jour. Myc. **13**: 31. 1907.

Cycle of development includes only pycnia and telia, both subcuticular.

Pycnia hemispherical; hymenium flat; ostiolar filaments wanting.

Telia erumpent, somewhat indefinite, without paraphyses. Teliospores free, two-celled by transverse septum, verrucose, the cells similar in shape and size; wall indistinctly laminate, colored, gelatinous layer obscure, the pores one in each cell, apical in upper cell, near the pedicel in lower cell; pedicels usually unappendaged.

Types species, *Puccinia elegans* Schröt. (on *Tecoma Stans*).

Teliospores slightly constricted, inconspicuously verrucose. 1. *N. transformans.*
Teliospores strongly constricted, prominently verrucose. 2. *N. conjuncta.*

1. **Nephlyctis transformans** (Ellis & Ev.) Arth. Jour. Myc. **13**: 32. 1907.

Puccinia transformans Ellis & Ev. Erythea **5**: 6. 1897.
Puccinia exitiosa Sydow & Holway; Sydow, Monog. Ured. 1: 245. 1902.

O. Pycnia amphigenous and caulicolous, 3–15 in orbicular groups, punctiform, cinnamon-brown, conspicuous, hemispherical or conoidal, 110–145 μ broad, 50–90 μ high; pycniospores very numerous above a flat hymenium.

III. Telia amphigenous, caulicolous, and fructicolous, causing hypertrophy, on leaves roundish, 0.1–0.5 cm. across, on stems and pods confluent over swellings 1–3 cm. long and nearly as broad and thick, soon naked, cinnamon-brown, very pulverulent, ruptured cuticle noticeable; teliospores ellipsoid, 16–22 by 27–35 μ, rounded at both ends, slightly constricted at the septum; wall cinnamon-brown, thick, 2–3.5 μ, slightly thicker at the apex, 3–5 μ, by a paler umbo, gelatinous layer scarcely perceptible, sparsely and finely verrucose; pedicel colorless, short, half length of spore or less, fragile.

ON BIGNONIACEAE:
Stenolobium molle (H.B.K.) Seem. (*Tecoma mollis* H.B.K.), Jalisco, Michoacan, Morelos, Puebla.
Stenolobium Stans (L.) D. Don (*Tecoma Stans* Juss.), Bahamas; Cuba; Lower California, Oaxaca.
TYPE LOCALITY: San Felipe, Lower California, Mexico, on *Tecoma Stans*.
DISTRIBUTION: Mexico and West Indies.
EXSICCATI: Vesterg. Micr. Rar. Sel. *864*; Barth. N. Am. Ured. *140*.

2. **Nephlyctis conjuncta** (Dietel & Holway) Arthur.

Puccinia conjuncta Dietel & Holway; Holway, Bot. Gaz. **31**: 335. 1901.

O. Pycnia chiefly epiphyllous, crowded on small brownish spots 0.5–2 mm. across, inconspicuous, subcuticular, hemispherical, 140–160 μ broad by about half as high; hymenium flat or nearly so.

III. Telia amphigenous, usually surrounding pycnia, few, crowded in orbicular groups 1–2.5 mm. across, often confluent, sometimes on stems in large masses, soon naked, dark cinnamon-brown, at first pulvinate, becoming pulverulent, ruptured cuticle barely noticeable; teliospores ellipsoid, 23–26 by 35–42 μ, rounded at both ends, strongly constricted at the septum forming two globular and nearly equal cells; wall dark cinnamon-brown, moderately thick, 2–2.5 μ, with apex slightly thicker, 3–6 μ, in part formed by the hyaline covering of the pore, sparsely and strongly verrucose with conoidal beads; pedicel colorless, short, fragile, breaking off near the spore.

ON VERBENACEAE:
Lippia Pringlei Briq., Oaxaca.
TYPE LOCALITY: Oaxaca, Mexico, on *Lippia Pringlei*.
DISTRIBUTION: Known only from the vicinity of the type locality.

16. **PHRAGMIDIUM** Link, Ges. Nat. Freunde Berlin Mag. 7: 30. 1815.

Puccinia Pers. Neues Mag. Bot. 1: 118. 1794. Not *Puccinia* Willd. 1787.
Caeoma Link, Ges. Nat. Freunde Berlin Mag. 3: 5, in part. 1809.
Hypodermium Link, Ges. Nat. Freunde Berlin Mag. 7: 26. 1815. Not *Hypoderma* DC. 1805.
Aregma Fries, Obs. Myc. 1: 225. 1815.
Epitea Fries, Syst. Myc. 3: 510. 1832.
Lecythea Lév. Ann. Sci. Nat. III. 8: 373. 1847.

Cycle of development includes pycnia, aecia, uredinia, and telia, with indistinct alternating phases; autoecious. Pycnia subcuticular, other sori subepidermal.

Pycnia conoidal, or flattened and indefinite, often extending downward between the epidermal cells; hymenium flat; ostiolar filaments wanting.

Aecia erumpent, mostly indefinite, without peridium, but usually encircled by paraphyses. Aeciospores catenulate, globoid; wall nearly or quite colorless, finely verrucose.

Uredinia erumpent, definite, usually encircled by paraphyses. Urediniospores borne singly on pedicels, often with paraphyses intermixed, globoid or ellipsoid; wall nearly or quite colorless, verrucosely or echinulately sculptured, the pores several, scattered, indistinct.

Telia erumpent, often first arising from the uredinia, usually definite, without paraphyses. Teliospores two- to several-celled by transverse septa; wall somewhat laminate, colored, more or less coarsely verrucose or even smooth, hygroscopic layer obscure, the pores two or more in each cell and lateral; pedicels refractive and usually more or less hygroscopic in lower part.

Type species, *Puccinia mucronata* Pers. (on *Rosa centifolia*).

Host belonging to tribe *Rubeae* (family *Rosaceae*).
- Uredinial paraphyses cylindrical or somewhat clavate, the wall not or only slightly thicker above.
  - Urediniospore-wall thin; teliospores broad (32–35 μ), 4–6-celled. — 1. *P. Peckianum.*
  - Urediniospore-wall moderately thin; teliospores rather slender (26–30 μ), 6–10-celled. — 2. *P. imitans.*
- Uredinial paraphyses distinctly clavate, the wall much thicker above.
  - Urediniospore-wall thin; teliospores rather broad (29–34 μ), 7–10-celled. — 3. *P. Rubi-odorati.*
  - Urediniospore-wall moderately thin; teliospores rather slender (26–29 μ), 6–9-celled. — 4. *P. occidentale.*

Host belonging to tribe *Roseae* (family *Rosaceae*).
- Urediniospore-wall thin, about 1 μ; teliospores slender, 8–11- (mostly 9- or 10-) celled.
  - Urediniospores 18–20 μ and teliospores 65–100 μ long. — 5. *P. americanum.*
  - Urediniospores 20–26 μ and teliospores 85–125 μ long. — 6. *P. Rosae-setigerae.*
- Urediniospore-wall moderately thick, 1.5–2 μ.
  - Teliospores slender, 7–11- (mostly 9-) celled.
    - Upper part of teliospore acute.
      - Pedicel much longer than the spore, swelling slightly. — 7. *P. Rosae-acicularis.*
      - Pedicel about the length of the spore, swelling greatly. — 8. *P. montivagum.*
    - Upper part of teliospore acuminate; pedicel much longer than the spore. — 9. *P. Rosae-californicae.*
  - Teliospores stout, 5–8- (mostly 6- or 7-) celled; pedicel longer than the spore.
    - Teliospores blackish, the upper part acute.
      - Swollen part of pedicel about as long as its upper part. — 10. *P. Rosae-arkansanae.*
      - Swollen part of pedicel much longer than its upper part. — 11. *P. disciflorum.*
    - Teliospores brown, the upper part acuminate. — 12. *P. subcorticinum.*

Host belonging to tribe *Potentilleae* (family *Rosaceae*).
- Teliospores apiculate; pedicels much swollen in lower part.
  - Teliospores 3–5- (mostly 4-) celled; apiculus small. — 13. *P. Andersoni.*
  - Teliospores 4–10- (mostly 5–8-) celled; apiculus large. — 14. *P. Jonesii.*
- Teliospores not apiculate; pedicels not or only slightly swollen in lower part.
  - Teliospores 2–4- (mostly 3-) celled; pedicels short. — 15. *P. Ivesiae.*
  - Teliospores 3–5- (mostly 4-) celled; pedicels long. — 16. *P. Potentillae.*

1. **Phragmidium Peckianum** Arthur.

Lecythea speciosa Peck, Bot. Gaz. 3: 34. 1878. Not *Phragmidium speciosum* Cooke, 1875.
Uredo speciosa De-Toni, in Sacc. Syll. Fung. 7: 860. 1888.

O. Pycnia epiphyllous, few, gregarious, in small groups on discolored spots, inconspicuous, subcuticular, pale honey-yellow, discoidal, low, 128–160 μ broad, 32–38 μ high, often confluent.

I. Aecia hypophyllous, usually compound or confluent, forming sori of roundish outline 0.5–1.5 mm. across, pulvinate, bright orange-yellow fading to pale-yellow, ruptured epidermis not noticeable; paraphyses not numerous nor conspicuous, surrounding each individual sorus, incurved, not exceeding the height of the spore-mass, clavate, 12–15 by 55–80 μ, the wall evenly thin, about 1 μ, nearly or quite colorless, smooth; aeciospores broadly ellipsoid, 19–24 by 23–31 μ; wall pale-yellow, moderately thick, 1.5–2.5 μ, moderately and closely verrucose.

II. Uredinia hypophyllous, rather numerous, scattered, roundish, small, 0.1–0.3 mm. across, early naked, ruptured epidermis inconspicuous; paraphyses encircling the sorus, abundant and conspicuous, strongly incurved, cylindrical or somewhat clavate, 7–12 by 42–85 μ, the wall thin, about 1 μ, slightly thicker at the apex, nearly or quite colorless, smooth; urediniospores broadly ellipsoid or obovate, 15–19 by 19–26 μ; wall pale-yellow, thin, 1–1.5 μ, moderately verrucose-echinulate, the pores not distinct, scattered, 6 or more.

III. Telia hypophyllous, rather numerous, at first arising from the uredinia, scattered, small, 0.1–0.3 mm. across; paraphyses none; teliospores cylindrical, 32–35 by 64–90 μ, rounded above and below, 4–6- (mostly 5-) celled; wall chocolate-brown, 4–6 μ thick, closely and moderately verrucose, the apex with a conical hyaline papilla 5–12 μ long; pedicel rugose when dry, once and a half length of spore, the upper half colorless except near the spore, 7–10 μ in diameter, the lower part colorless, swelling in water to broadly lanceolate, 22–30 μ at broadest diameter.

ON ROSACEAE:
Oreobatus deliciosus (James) Rydb. (*Rubus deliciosus* James), Colorado, New Mexico.
Oreobatus neo-mexicanus (A. Gray) Rydb. (*Rubus neo-mexicanus* A. Gray), Arizona, New Mexico.
TYPE LOCALITY: Colorado, on *Rubus deliciosus*.
DISTRIBUTION: Northern Colorado southward nearly to the Mexican boundary.
EXSICCATI: Ellis & Ev. Fungi Columb. *877*; Barth. Fungi Columb. *2340*, *2442*; Ellis & Ev. N. Am. Fungi *3246*; Clements, Crypt. Form. Colo. *153*; Vesterg. Micr. Rar. Sel. *1131*.

2. **Phragmidium imitans** Arthur.

Phragmidium incrassatum gracile Farl.; Ellis, N. Am. Fungi *282*, hyponym. 1879.
Phragmidium gracile Arth. Bull. Iowa Agr. Coll. Dep. Bot. 1884: 161. 1884. Not *P. gracile* Cooke, 1871.

O. Pycnia epiphyllous, solitary or few in small crowded groups completely surrounded by the aecia, not noticeable, subcuticular, yellowish, conoidal, small, 50–80 μ in diameter, 30–35 μ high.

I. Aecia epiphyllous, confluent in small annular groups 0.4–0.8 mm. across, pulvinate, orange-yellow fading to pale-yellow, ruptured epidermis somewhat noticeable; paraphyses not very numerous nor conspicuous, surrounding each individual sorus, incurved, somewhat exceeding the height of spore-mass, clavate, 10–15 by 45–96 μ, the wall evenly thin, about 1 μ, nearly or quite colorless, smooth; aeciospores globoid or broadly ellipsoid, 14–20 by 16–24 μ; wall pale-yellow, moderately thick, 1.5–2.5 μ, sparsely and sharply papillose.

II. Uredinia hypophyllous, scattered, roundish, small, 0.1–0.2 mm. across, early naked, ruptured epidermis inconspicuous; paraphyses encircling the sorus, rather numerous, incurved, somewhat clavate, 11–17 by 67–96 μ, the wall uniform, thin, about 1 μ, nearly or quite colorless, smooth; urediniospores broadly ellipsoid, 15–18 by 18–23 μ; wall pale-yellow, rather thin, about 1.5 μ, sparsely and rather strongly verrucose-echinulate, the pores obscure.

III. Telia hypophyllous, rather numerous, at first arising from the uredinia, scattered, 0.3–0.7 mm. across, very early naked, blackish, ruptured epidermis inconspicuous; paraphyses none; teliospores cylindrical, 26–30 by 80–120 μ, usually rounded below, rounded or sometimes narrowed above, 6–10-celled; wall very dark chocolate-brown, rather thick, 6–7 μ, closely and rather coarsely verrucose, the apex with a blunt, conical hyaline apiculus 3–13 μ long; pedicel rugose when dry, the upper half colorless except near the spore, 9–10 μ in diameter, the lower part colorless, swelling in water to claviform, 15–23 μ in diameter.

ON ROSACEAE:
Rubus leucodermis Dougl., California, Washington; British Columbia.
Rubus occidentalis L., Massachusetts; Newfoundland.

Rubus strigosus Michx. (*R. idaeus canadensis* Richardson), Colorado, Illinois, Iowa, Maine, Massachusetts, Minnesota, Montana, Oregon, South Dakota, Washington; British Columbia, New Brunswick, Newfoundland, Nova Scotia, Ontario.

TYPE LOCALITY: Decorah, Iowa, on *Rubus strigosus*.

DISTRIBUTION: Massachusetts to Colorado and northern California, and northward into Canada.

EXSICCATTI: Ellis, N. Am. Fungi *282* in part, *1480;* Ellis & Ev. Fungi Columb. *870, 1386;* Barth. Fungi Columb. *2748;* D. Griff. W. Am. Fungi *251;* Sydow, Ured. *1146;* Seym. & Earle, Econ. Fungi *33*.

3. **Phragmidium Rubi-odorati** Dietel, Hedwigia **44**: 120. 1905.

O. Pycnia not seen.

I. Aecia amphigenous, irregular in outline, more or less confluent, 0.2–1 mm. across, on pale-yellowish spots 1–2 mm. across, soon naked, orange-yellow fading to pale-yellow, pulverulent, ruptured epidermis scarcely noticeable; paraphyses rather conspicuous, surrounding each individual sorus, numerous, exserted and slightly incurved, with many shorter ones outside beneath the epidermis forming a kind of colorless stroma, terete, 9–13 by 65–100 μ, the wall thin, 1 μ, much thicker at apex, 3–5 μ; aeciospores globoid or broadly ellipsoid, 15–19 by 18–24 μ; wall nearly colorless, moderately thick, 2–2.5 μ, coarsely verrucose with large irregular warts.

II. Uredinia hypophyllous, small, scattered, round, 0.1–0.3 mm. across, early naked, ruptured epidermis inconspicuous; paraphyses surrounding the sorus, abundant and conspicuous, incurved, clavate, 9–12 by 51–80 μ, the wall thin, about 1 μ, thicker on upper side of curve toward the apex, 2–4 μ, nearly or quite colorless, smooth; urediniospores ellipsoid or subglobose, 15–18 by 18–23 μ; wall pale-yellow, thin, about 1 μ, strongly and rather sparsely verrucose-echinulate, the pores indistinct, scattered.

III. Telia hypophyllous, at first arising from the uredinia, scattered, small, roundish, 0.2–0.7 mm. across; paraphyses none; teliospores cylindrical, 29–34 by 80–110 μ, rounded above and below, 7–10-celled; wall very dark chocolate-brown, 5–7 μ thick, closely and moderately verrucose, with a long conical hyaline apiculus above, 7–17 μ; pedicel about length of the spore, rugose when dry, the upper half colorless except near the spore, the lower part colorless swelling in water to lanceolate, 16–22 μ at broadest diameter.

ON ROSACEAE:

Rubacer odoratum (L.) Small (*Rubus odoratus* L.), Connecticut, Maine, New York, North Carolina, Vermont, West Virginia; Ontario.

TYPE LOCALITY: North America, on *Rubus odoratus*.

DISTRIBUTION: Western North Carolina and eastern Ontario eastward, nearly throughout the range of the host.

4. **Phragmidium occidentale** Arth.; Earle, in Greene, Pl. Baker. **2**: 3. 1901.

O. Pycnia epiphyllous, few in small groups on discolored spots 1–1.5 mm. across, inconspicuous, subcuticular, pale honey-yellow, low, discoidal, 144–160 μ broad by 42–48 μ high.

I. Aecia hypophyllous, small, usually confluent, forming rather compact compound sori of roundish outline 0.4–1 mm. across, pulvinate, bright orange-yellow fading to pale-yellow, ruptured epidermis not noticeable; paraphyses not very numerous nor conspicuous, surrounding each individual sorus, incurved, slightly or not at all exceeding the height of the spore-mass, mostly clavate, 10–19 by 64–80 μ, the wall rather thin, 1–1.5 μ, uniform, nearly or quite colorless, smooth; aeciospores broadly ellipsoid, 16–20 by 20–29 μ; wall pale-yellow, moderately thick, 1.5–2.5 μ, moderately verrucose with low rounded papillae.

II. Uredinia hypophyllous, small, scattered, roundish, 0.2–0.4 mm. across, early naked, ruptured epidermis inconspicuous; paraphyses surrounding the sorus, abundant and conspicuous, incurved, clavate, 10–16 by 48–75 μ, the wall thin, 1–1.5 μ, considerably thickened at the apex, 4–8 μ, nearly or quite colorless, smooth; urediniospores broadly ellipsoid, 15–19 by 19–25 μ; wall pale-yellow, moderately thin, 1.5–2 μ, moderately echinulate-verrucose, the pores indistinct, scattered, about 6.

III. Telia hypophyllous, at first arising from the uredinia, scattered, small, 0.3–0.7 mm. across; paraphyses none; teliospores cylindrical, 26–29 by 65–110 μ, rounded above and

below, 6–9-celled; wall dark chocolate-brown, 5–6 μ thick, closely and rather coarsely verrucose, the apex with a conical hyaline papilla 8–11 μ long; pedicel about length of spore, rugose when dry, the upper half colorless except near the spore, 7–10 μ in diameter, the lower part colorless, swelling in water to broadly clavate, 18–26 μ at broadest diameter.

ON ROSACEAE:

Rubacer parviflorum (Nutt.) Rydb. (*Rubus nutkanus* Moc., *R. parviflorus* Nutt.), California, Colorado, Idaho, Minnesota, Montana, New Mexico, Oregon, Washington, Wisconsin, Wyoming; British Columbia.

TYPE LOCALITY: Mountains near Pagosa Peak, Colorado, on *Rubus nutkanus*.

DISTRIBUTION: Mountainous region from central New Mexico and central California northward into Canada.

EXSICCATI: Sydow, Ured. *1788*, *1789*; Ellis & Ev. N. Am. Fungi *3245*; D. Griff. W. Am. Fungi *274*, *329*; Seym. & Earle, Econ. Fungi *34*; Barth. N. Am. Ured. *115*; Barth. Fungi Columb. *2747*, *3156*.

5. **Phragmidium americanum** Dietel, Hedwigia **44**: 124. .1905.

Phragmidium mucronatum americanum Peck, Ann. Rep. N. Y. State Mus. **28**: 86. 1876.

O. Pycnia chiefly epiphyllous, usually few, gregarious and often confluent, inconspicuous, subcuticular and extending downward between the cells, pale honey-yellow, low-conoidal or discoidal, 80–125 μ broad by 30–40 μ high.

I. Aecia chiefly hypophyllous or petiolicolous, usually compound or confluent, forming sori of irregular outline, 1–5 mm. across, applanate, bright orange-yellow fading to pale-yellow, ruptured epidermis usually noticeable; paraphyses rather numerous but inconspicuous, surrounding each individual sorus, erect, not exceeding the height of the spore-mass, clavate, 10–20 by 38–50 μ, the wall evenly thin, 1 μ, nearly or quite colorless, smooth; aeciospores broadly ellipsoid or globoid, small, 18–20 by 20–26 μ; wall pale-yellow, rather thin, 1–1.5 μ, finely and closely verrucose with well-separated papillae.

II. Uredinia hypophyllous, numerous, thickly scattered, round, small, 0.1 mm. or less across, early naked, ruptured epidermis inconspicuous; paraphyses encircling the sorus, abundant and conspicuous, strongly incurved, cylindrical or somewhat clavate, 9–13 by 30–55 μ, the wall evenly thin, 1 μ or less, nearly or quite colorless, smooth; urediniospores obovate-globoid, small, 15–18 by 18–20 μ; wall pale-yellow, thin, 1 μ, rather closely verrucose-echinulate, the pores indistinct, small, scattered, 8 or more.

III. Telia hypophyllous, at first arising from the uredinia, numerous, thickly scattered, small, 0.1 mm. or less across, few spores in each sorus, ruptured epidermis inconspicuous; paraphyses none; teliospores cylindrical, 23–26 by 64–100 μ, slightly or not narrowed above or below, 8–11- (mostly 10-) celled; wall blackish-brown, 3–7 μ thick, closely and rather coarsely verrucose, the apex usually with a conical hyaline papilla 10–13 μ long; pedicel rugose when dry, once and a half length of spore, the upper half colorless except near the spore, 7 μ in diameter, the lower part colorless, usually terete, swelling in water, 16–20 μ in diameter.

The telia of this species in some collections much resemble those of *Phragmidium Rosae-aciculares*. In general the several species of the genus *Phragmidium* occurring on roses show so much variation that it is often necessary in order to determine species as here defined to take into account not only the morphological characters of the fungus but also the physical features of the host and the geographic location.

ON ROSACEAE:

Rosa blanda Ait., Vermont; Ontario.

Rosa humilis Marsh., Delaware, New York.

Rosa virginiana Mill. (*R. lucida* Ehrh.), Maine, Massachusetts, New Jersey; Nova Scotia.

Rosa sp. cult., District of Columbia, Indiana, Iowa, Kentucky, Massachusetts, Nebraska, New Jersey, New York, West Virginia, Wisconsin; Ontario.

TYPE LOCALITY: North America, on *Rosa blanda*.

DISTRIBUTION: Delaware to southern Ontario and northeastward to Nova Scotia on native roses, and locally on cultivated roses from the northern Atlantic coast as far west as central Nebraska.

EXSICCATI: Ellis, N. Am. Fungi *276*, *1065*; Ellis & Ev. Fungi Columb. *2132*; Seym. & Earle, Econ. Fungi *36*; Shear, N. Y. Fungi *66*, *122*.

ILLUSTRATIONS: Torreya **9**: *22*, *f. 1*; Hedwigia **44**: *pl. 4*, *f. 5*.

6. **Phragmidium Rosae-setigerae** Dietel, Hedwigia **44**: 125. 1905.

O. Pycnia chiefly epiphyllous, gregarious, usually few, in small groups opposite the aecia, often somewhat confluent, inconspicuous, subcuticular, extending into the lateral walls of the epidermal cells, pale honey-yellow, discoidal, 100–160 μ in diameter by 30–40 μ high.

I. Aecia hypophyllous and petiolicolous, often compound and confluent, 0.5–1 mm. across, applanate, bright orange-yellow fading to pale-yellow, ruptured epidermis usually conspicuous; paraphyses not numerous nor conspicuous, surrounding each individual sorus, erect, not equaling the height of the spore-mass, clavate, 10–16 by 40–48 μ, the wall evenly thin, 1 μ, nearly or quite colorless, smooth; aeciospores broadly ellipsoid or globoid, 19–26 by 21–27 μ; wall pale-yellow, rather thin, 1–1.5 μ, finely and indistinctly verrucose, the pores large, obscure.

II. Uredinia hypophyllous, numerous, thickly scattered, round, very small, 0.05–0.1 mm. across, early naked, ruptured epidermis inconspicuous; paraphyses encircling the sorus, abundant and conspicuous, strongly incurved, cylindrical or somewhat clavate, 7–13 by 42–70 μ, the wall thin, 1 μ, often thickened at or near the end up to 3 μ, nearly or quite colorless, smooth; urediniospores obovate-globoid, large, 16–23 by 20–26 μ; wall yellowish, thin, 1–1.5 μ, rather closely verrucose-echinulate, with papillae less than 1 μ apart, the pores indistinct, small, scattered, about 8.

III. Telia hypophyllous, at first arising from the uredinia, rather thickly scattered, 0.1 mm. across, usually many spores in each sorus, ruptured epidermis inconspicuous; paraphyses none; teliospores cylindrical, not generally narrowed above or below, 24–30 by 85–125 μ, 8–11- (usually 9- or 10-) celled; wall blackish-brown, 5–7μ thick, closely and rather coarsely verrucose, the apex with a prominent, brownish, subhyaline apiculus, usually slightly roughened, 10–13 μ long; pedicel once to once and a half length of spore, the upper part brownish, 9–10 μ in diameter, the lower part hygroscopic, colorless, much longer than the upper part, in water becoming oblanceolate, 18–23 μ in broadest diameter.

ON ROSACEAE:
Rosa carolina L., District of Columbia, Illinois, Maryland, Mississippi, New Hampshire, New York, Wisconsin; Ontario.
Rosa setigera Michx., Illinois, Indiana, Kansas, Nebraska.

TYPE LOCALITY: North America, on *Rosa setigera*.

DISTRIBUTION: Northward from Maryland, northern Mississippi and Kansas to southern Ontario, nearly throughout the region of the hosts.

ILLUSTRATIONS: Torreya 9: 22, *f. 2*; Hedwigia 44: *pl. 4, f. 6*.

7. **Phragmidium Rosae-acicularis** Liro, Bidr. Finl. Nat. Folk **65**: 428. 1908.

O. Pycnia amphigenous, gregarious and usually confluent, numerous in small groups surrounded by aecia or on spots opposite the aecia, inconspicuous, subcuticular, extending into the lateral walls of the epidermal cells, discoidal, low, 48–77 μ in diameter by 26–35 μ high.

I. Aecia hypophyllous and caulicolous, on leaves in annular groups about 1–1.5 mm. across, surrounding the pycnia, on veins and stems swelling into elongate masses 2–15 mm. long, orange-colored fading to light-yellow, ruptured epidermis usually conspicuous; paraphyses abundant, conspicuous, surrounding each individual sorus, erect or slightly incurved, noticeably taller than the spore-mass, terete-clavate, or capitate-clavate, 13–16 by 47–55 μ, the wall evenly thin, about 1 μ, colorless, smooth; aeciospores broadly ellipsoid or obovate-ellipsoid, 18–21 $\times$ 24–30 μ; wall nearly or quite colorless, moderately thick, 2–3 μ, rather closely echinulate-verrucose, the pores very indistinct.

II. Uredinia hypophyllous, numerous, scattered, round, small, about 0.1 mm. across, soon naked, ruptured epidermis inconspicuous; paraphyses numerous and conspicuous, encircling the sorus, strongly incurved, cylindrical or slightly clavate, 12–16 by 48–58 μ, the wall thin, about 1 μ, considerably thicker above and on outer side of curve, nearly or quite colorless, smooth; urediniospores obovate-globoid or broadly ellipsoid, 15–21 by 18–26 μ; wall pale-pellow, moderately thin, 1.5–2 μ, somewhat closely verrucose-echinulate, the pores usually indistinct, scattered, 6 or more.

III. Telia hypophyllous, at first arising from the uredinia, numerous, scattered, 0.2–0.5 mm. across, blackish, ruptured epidermis inconspicuous; paraphyses none; teliospores blackish or blackish-brown, cylindrical or fusiform-cylindrical, 19–29 by 48–93 μ, rounded below, somewhat acute above, not constricted at the septa, 5–11- (usually 9-) celled; wall not very dense, with conspicuous pores, rather thin, 4–5 μ, closely and moderately verrucose, the apex with a brownish subhyaline apiculus, usually rough, 7–12 μ long; pedicel rugose when dry, once

and a half to twice length of spore, the upper part brownish especially near the spore, 9–10 μ in diameter, the lower part hygroscopic, colorless, longer than upper part, in water becoming linear or somewhat oblanceolate, 16–20 μ in broadest diameter.

ON ROSACEAE:
Rosa acicularis Lindl., Alaska.
Rosa Engelmanni S. Wats., Minnesota, North Dakota.
Rosa heliophila Greene (*R. arkansana* S. Wats. not Porter, *R. pratincola* Greene), North Dakota.
Rosa Macdougali Holz., Idaho, Montana.
Rosa nutkana Presl, Idaho, Montana; Alaska.
Rosa Sayi Schw. (*R. acicularis Bourgeauiana* Crépin), Michigan, Minnesota; Ontario.
TYPE LOCALITY: Sordavala, Finland, on *Rosa acicularis*.
DISTRIBUTION: Western Ontario and the northern border of the United States from Michigan to Idaho, northward and westward into Canada, and Alaska; also in northern Russia.
EXSICCATI: Sydow, Ured. *2282*.

8. **Phragmidium montivagum** Arth. Torreya **9**: 24. 1909.

O. Pycnia amphigenous, gregarious and often confluent, in small groups surrounded by aecia or on spots opposite the aecia, inconspicuous, subcuticular, extending into the lateral walls of the epidermal cells, pale honey-yellow, discoidal, low, 80–112 μ in diameter by 30–35 μ high.

I. Aecia hypophyllous and petiolicolous, 0.4–1.5 mm. across, solitary, or in irregular groups, on petioles and young shoots causing some hypertrophy and distortion, often confluent over areas 5–10 mm. long, applanate, bright orange-yellow fading to pale-yellow, ruptured epidermis usually not conspicuous; paraphyses abundant, conspicuous, surrounding each individual sorus, somewhat curved, noticeably taller than the spore-mass, spatulate-capitate or clavate, 12–25 by 50–70 μ, the wall evenly thin, 1–1.5 μ, nearly or quite colorless, smooth; aeciospores globoid or broadly ellipsoid, 16–19 by 21–26 μ, the wall nearly colorless, moderately thin, 1.5–2 μ, rather sparsely but distinctly verrucose, the pores indistinct, scattered, about 8.

II. Uredinia hypophyllous, numerous, scattered, round, small, about 0.1 mm. or less across, soon naked, ruptured epidermis inconspicuous; paraphyses numerous and noticeable, encircling the sorus, incurved, cylindrical or slightly clavate, 9–11 by 45–64 μ, the wall thin, about 1 μ, slightly thicker above on outer side of curve, nearly or quite colorless, smooth; urediniospores obovate-globoid, 16–20 by 18–24 μ; wall pale-yellow, moderately thick, 1.5–2 μ, closely verrucose-echinulate, with points about 2 μ apart, the pores indistinct, scattered, 6 or more.

III. Telia hypophyllous, at first arising from the uredinia, numerous, thickly scattered, 0.1–0.5 mm. across, blackish or blackish-brown, ruptured epidermis inconspicuous; paraphyses none; teliospores cylindrical, 24–29 by 64–96 μ, usually rounded below and narrowed above, 6–9- (usually 8-) celled; wall closely and moderately verrucose, the apex usually with a conical subhyaline apiculus 7–10 μ long; pedicel rugose when dry, slightly more than once length of spore, the upper part colorless except near the spore, 7–9 μ in diameter, the lower part colorless, swelling in water to oblanceolate or narrowly ellipsoid, 15–30 μ at broadest diameter.

ON ROSACEAE:
Rosa aciculata (Cockerell) Rydb., Colorado.
Rosa Bakeri Rydb., Colorado.
Rosa Engelmanni S. Wats., Colorado, South Dakota, Wyoming.
Rosa Fendleri Crépin, Colorado, Montana.
Rosa grosse-serrata E. Nels., Utah, Wyoming.
Rosa gymnocarpa Nutt., Montana.
Rosa gymnocarpa pubescens S. Wats., California.
Rosa Macounii Greene, Colorado, Utah, Wyoming.
Rosa manca Greene, Colorado.
Rosa Maximiliani Nees (*R. Woodsii* S. Wats. not Lindl.), Colorado, Montana, Wyoming.
Rosa Sayi Schw., Colorado, Montana, Wyoming.
Rosa Underwoodii Rydb., Colorado.

TYPE LOCALITY: Cummings, Albany county, Wyoming, on *Rosa Sayi*.
DISTRIBUTION: Mountains from Colorado to western California and northward in the United States, nearly to the Canadian boundary, and in the Black Hills of South Dakota.
EXSICCATI: Clements, Crypt. Form. Colo. *150*, *586*; Barth. Fungi Columb. *2341*, *2946*; Barth. N. Am. Ured. *114*; Garrett, Fungi Utah. *179*, *180*.
ILLUSTRATION: Torreya 9: 23, *f.* 5.

9. **Phragmidium Rosae-californicae** Dietel, Hedwigia **44**: 125. 1905.

O. Pycnia not seen, rarely formed.

I. Aecia hypophyllous, round or oblong, 0.5–2 mm. across, solitary or in annular or irregular groups, on petioles and young shoots causing considerable hypertrophy and distortion, often confluent over areas 10–15 mm. long, applanate, bright orange-yellow fading to pale-yellow, ruptured epidermis usually noticeable; paraphyses numerous, surrounding each individual sorus, somewhat incurved, scarcely as tall as the spore-mass, narrowly clavate, or slightly capitate, 13–16 by 50–65 μ, the wall evenly thin, usually less than 1 μ, nearly or quite colorless, smooth; aeciospores globoid or globose-ellipsoid, 13–20 by 18–27 μ; wall nearly colorless, rather thick, 2–3 μ, finely and distinctly verrucose with well-separated papillae, the pores large, distinct, about 8.

II. Uredinia hypophyllous, numerous, thickly scattered, round, small, 0.1–0.2 mm. across, early naked, ruptured epidermis inconspicuous; paraphyses encircling the sorus, abundant and conspicuous, strongly incurved, usually somewhat clavate, 7–12 by 39–61 μ, the wall thin, 1 μ, slightly thicker above toward the apex, nearly or quite colorless, smooth; urediniospores obovate or broadly ellipsoid, 16–19 by 19–25 μ; wall pale-yellow, rather thick, 2–2.5 μ, closely verrucose-echinulate, the pores indistinct, scattered, 6 or more.

III. Telia hypophyllous, at first arising from the uredinia, 0.2–0.5 mm. across, usually few spores in each sorus, ruptured epidermis inconspicuous; paraphyses none; teliospores cylindrical, 26–30 by 90–112 μ, rounded or narrowed below, attenuate above toward the apical papilla, 8–11-celled; wall blackish-brown, about 5 μ thick, closely and moderately verrucose, the apex usually with a conical subhyaline papilla somewhat roughened about the base, 7–12 μ long; pedicel rugose when dry, the upper half colorless except near spore, 8–10 μ in diameter, the lower part colorless, swelling in water to lanceolate, 25–35 μ at the broadest diameter.

ON ROSACEAE:
Rosa californica Cham. & Schlecht. (*R. spithamea* A. Gray), California, Oregon.
Rosa gymnocarpa Nutt., California, Oregon, Washington.
Rosa gymnocarpa pubescens S. Wats., California.
Rosa minutifolia Engelm., California.
Rosa nutkana Presl, Washington; British Columbia.
Rosa pisocarpa A. Gray, Washington; British Columbia.
Rosa sonomensis Greene, California.

TYPE LOCALITY: Sisson, California, on *Rosa californica*.
DISTRIBUTION: Along the Pacific slope from southern California to British Columbia.
EXSICCATI: Sydow, Ured. *1390, 1836;* Ellis & Ev. Fungi Columb. *1751;* Barth. Fungi Columb. *3051, 3157, 3158.*
ILLUSTRATIONS: Torreya 9: 22, *f. 3;* Hedwigia 44: *pl. 4, f. 7.*

10. **Phragmidium Rosae-arkansanae** Dietel, Hedwigia **44**: 333. 1905.

O. Pycnia chiefly epiphyllous, usually few, in small groups opposite the aecia, often confluent, inconspicuous, subcuticular, extending into the walls of the epidermal cells, pale honey-yellow, discoidal, low, 80–145 μ in diameter by 25–35 μ high.

I. Aecia chiefly epiphyllous and petiolicolous, 0.3–0.8 mm. across, solitary or in annular or irregular groups, sometimes confluent on the petioles forming sori 1–2 mm. or more long, applanate, bright orange-yellow fading to pale-yellow, ruptured epidermis usually noticeable; paraphyses rather few, inconspicuous, surrounding each individual sorus, erect, clavate, 10–13 by 50–65 μ, the wall evenly thin, 1 μ, nearly or quite colorless, smooth; aeciospores broadly ellipsoid or globoid, 19–23 by 23–29 μ; wall nearly colorless, rather thin, 1.5–2 μ, finely but sparsely and distinctly verrucose, the pores evident, scattered, about 8.

II. Uredinia hypophyllous, numerous, thickly scattered, round, small, 0.1 mm. or less across, early naked, ruptured epidermis inconspicuous; paraphyses encircling the sorus, abundant and conspicuous, strongly incurved, mostly cylindrical, 7–12 by 40–60 μ, the wall evenly thin, 1 μ or less, nearly or quite colorless, smooth; urediniospores obovate-globoid, 15–19 by 18–23 μ; wall pale-yellow, moderately thick, 1.5 μ, rather closely verrucose-echinulate, the pores indistinct, small, scattered, about 8.

III. Telia hypophyllous, at first arising from the uredinia, very numerous, scattered, usually crowded, rather large, 0.1–0.2 mm. across, very many spores in each sorus, rup-

tured epidermis inconspicuous; paraphyses none; teliospores short-cylindrical, 26–29 by 62–80 μ, slightly or not narrowed above and below, 5–8-celled; wall blackish-brown, 5–7 μ thick, closely and finely verrucose, the apex with a conical hyaline papilla 1–5 μ long, smooth; pedicel rugose when dry, once and a fourth length of spore, the upper part colored especially near the spore, 7–9 μ in diameter, 26–35 μ long, the lower part colorless, 65–112 μ long, swelling in water to claviform and becoming 23–30 μ in diameter.

ON ROSACEAE:

Rosa Engelmanni S. Wats., Nebraska, South Dakota.
Rosa Fendleri Crépin, Colorado, Nebraska, South Dakota.
Rosa Maximiliani Nees (*R. Woodsii* S. Wats. not Lindl.), Colorado, Nebraska.
Rosa heliophila Greene (*R. arkansana* S. Wats. not Porter, *R. pratincola* Greene), Illinois, Iowa, Kansas, Missouri, Nebraska, South Dakota.

TYPE LOCALITY: Manhattan, Kansas, on "*Rosa arkansana*," now determined as *R. heliophila*.

DISTRIBUTION: Prairies from Missouri and eastern Colorado nearly to the northern boundary of the United States.

EXSICCATI: Carleton, Ured. Am. *15;* Ellis & Ev. Fungi Columb. *1632, 1947;* Sydow, Ured. *1093;* Seym. & Earle, Econ. Fungi *35;* D. Griff. W. Am. Fungi *37*.

ILLUSTRATIONS: Torreya **9**: 23, *f. 4;* Hedwigia **44**: *pl. 4, f. 2*.

11. **Phragmidium disciflorum** (Tode) J. F. James, Contr. U. S. Nat. Herb. **3**: 276. 1895.

Ascophora disciflora Tode, Fungi Meckl. 1: 16. 1790.
Ascophora disciflora a solida Tode, Fungi Meckl. 1: 16. 1790.
Uredo Rosae Pers. Neues Mag. Bot. 1: 93. 1794.
Puccinia mucronata a Rosae Pers. Neues Mag. Bot. 1: 118. 1794.
Uredo Rosae-centifoliae Pers. Syn. Fung. 215. 1801.
Uredo Rosae Schum. Enum. Pl. Saell. **2**: 230. 1803.
Puccinia Rosae Schum. Enum. Pl. Saell. **2**: 235. 1803.
Aregma mucronata Fries, Obs. Myc. 1: 225. 1815.
Uredo effusa a Rosae Mart. Fl. Crypt. Erlang. 318. 1817.
Caeoma Rosae Schlecht. Fl. Berol. **2**: 120. 1824.
Phragmidium mucronatum Schlecht. Fl. Berol. **2**: 156. 1824.
Caeoma Rosae punctiforme Link, in Willd. Sp. Pl. 6^2: 30. 1825.
Erysibe Rosae Wallr. Fl. Crypt. Germ. **2**: 200. 1833.
Erannium miniatum Bon. Coniom. 17. 1860.
Phragmidium oblongum Bon. Coniom. 60. 1860.
Phragmidium Rosarum Fuckel, Symb. Myc. 47. 1869.
Aregma disciflora Arth. Proc. Ind. Acad. Sci. **1898**: 179. 1899.

O. Pycnia chiefly epiphyllous, usually few, gregarious and often somewhat confluent, inconspicuous, pale honey-yellow, flattened-conoidal or discoidal, extending into the lateral walls of the epidermal cells, 112–150 μ in diameter by 35–40 μ high.

I. Aecia hypophyllous and caulicolous, roundish or oblong, 1–2 mm. across, usually crowded and confluent over considerable areas, on the stems sometimes 2–4 mm. wide by 5–15 mm. long, applanate, bright orange-yellow fading to pale-yellow, ruptured epidermis usually conspicuous; paraphyses numerous but not conspicuous, surrounding each individual sorus, erect, exceeding somewhat the height of the spore-mass, clavate-capitate, 10–21 by 50–80 μ, the wall evenly thin, 1 μ, nearly or quite colorless, smooth; aeciospores broadly ellipsoid or globoid, 15–20 by 22–29 μ; wall pale-yellow, rather thick, 2–3 μ, finely and distinctly verrucose, the pores large, indistinct.

II. Uredinia hypophyllous, numerous, thickly scattered, round, 0.1–0.2 mm. across, early naked, ruptured epidermis inconspicuous; paraphyses encircling the sorus, abundant and conspicuous, strongly incurved, cylindrical or somewhat clavate, 9–13 by 55–74 μ, the wall evenly thin, 1 μ or less, nearly or quite colorless, smooth; urediniospores obovate or obovate-globoid, 16–19 by 20–26 μ; wall pale-yellow, moderately thick, 2 μ, closely verrucose-echinulate, the pores indistinct, small, scattered, 8 or more.

III. Telia hypophyllous, at first arising from the uredinia, numerous, thickly scattered, about 0.1 mm. across, but appearing much larger on account of the large number of spores in each sorus, early naked, blackish, ruptured epidermis inconspicuous; paraphyses none; teliospores oblong-terete or slightly obovate-terete, 22–33 by 64–90 μ, slightly narrowed above and below, 5–9-celled; wall blackish-brown, opaque, 5–7 μ thick, closely and very coarsely verrucose with semihyaline tubercles, the apical projection prominent, conical, 7–13 μ long, semihyaline, not grading into the rounded uppermost cell, distinctly roughened;

pedicel once and a half length of spore, the upper half colored, 8–10 μ in diameter, the lower half colorless, usually narrowed downward, swelling in water, 20–28 μ in diameter.

ON ROSACEAE:
Rosa alba L., Maryland, Nebraska.
Rosa gallica L. (*R. centifolia* L.), California, Nebraska; Mexico.
Rosa sp. cult., California, Connecticut, Delaware, Iowa, Massachusetts, Michigan, Nebraska, New York, Texas, Vermont, West Virginia; New Brunswick; Mexico, Oaxaca.
TYPE LOCALITY: Mecklenburg, Germany, on *Rosa alba*.
DISTRIBUTION: Throughout North America on cultivated roses, especially those having large and firm leaflets; also in Europe, western Asia, South America, and Hawaii.
ILLUSTRATIONS: Beitr. Krypt. Schweiz 2^2: *f. 281*; Torreya 9: 23, *f. 6*; Hedwigia 44: *pl. 4, f. 1*.
EXSICCATI: Ellis & Ev. Fungi Columb. *52*; Barth. Fungi Columb. *2745, 3049*; Barth. N. Am. Ured. *12*.

12. **Phragmidium subcorticinum** (Schrank) Wint. in Rab. Krypt. Fl. 1^1: 228. 1881.

Lycoperdon subcorticinum Schrank, Bot. Tasch. Hoppe 1793: 68. 1793.
Uredo miniata Pers. Syn. Fung. 216. 1801.
Uredo miniata α Eglanteriae Pers. Syn. Fung. 216. 1801.
Uredo elevata Schum. Enum. Pl. Saell. 2: 229. 1803.
Aecidium Rosae Röhling, Deuts. Fl. ed. 2. 3: 122. 1813.
Uredo Eglanteriae H. Mart. Fl. Mosq. ed. 2. 230. 1817.
Caeoma miniatum Schlecht. Fl. Berol. 2: 120. 1824.
Caeoma Rosae miniatum Link, in Willd. Sp. Pl. 6^2: 30. 1825.
Erysibe miniata rosarum Wallr. Fl. Crypt. Germ. 2: 200. 1833.
Coleosporium miniatum Bon. Coniom. 60, in part. 1860.
Phragmidium rosarum f. *R. pimpinellifoliae* Rab. Fungi Eur. *1671*, hyponym. 1873.
Caeoma exitiosum Sydow, Ured. *1700*, hyponym. 1903.
Phragmidium Rosae-pimpinellifoliae Dietel, Hedwigia 44: 339. 1905.

O. Pycnia chiefly caulicolous, usually abundant, irregularly distributed, often crowded, somewhat confluent, inconspicuous, pale honey-yellow, flattened-conoidal or discoidal, extending into the lateral walls of the epidermal cells, comparatively small, 50–120 μ in diameter by 15–30 μ high.

I. Aecia chiefly caulicolous, irregularly roundish or oblong, 1–2 mm. across, usually crowded and confluent over considerable areas, applanate, orange-yellow fading to pale-yellow, ruptured epidermis usually conspicuous; paraphyses none, few, or sometimes numerous, not conspicuous, surrounding each individual sorus, erect, exceeding considerably the height of the spore-mass, cylindrical, or somewhat clavate, 10–15 by 30–50 μ, the wall evenly thin, 1 μ, colorless, smooth; aeciospores broadly ellipsoid, or globoid, 13–19 by 19–25 μ; wall nearly colorless, moderately thick, 2–2.5 μ, finely and noticeably verrucose.

II. Uredinia hypophyllous, numerous, thickly scattered, round, 0.1–0.2 mm. across, early naked, orange-yellow fading to dirty-white, pulverulent, ruptured epidermis inconspicuous; paraphyses encircling the sorus, abundant and noticeable, strongly incurved, terete, or slightly clavate, 9–13 by 39–48 μ, the wall evenly thin, about 1 μ, colorless, smooth; urediniospores obovate-globoid, 16–18 by 21–24 μ; wall nearly or quite colorless, moderately thick, 2–2.5 μ, closely verrucose-echinulate, the pores indistinct, small, scattered.

III. Telia hypophyllous, at first arising from the uredinia, numerous, thickly scattered, about 0.1 mm. across, but appearing larger on account of the long spreading spores, early naked, chestnut-brown, ruptured epidermis inconspicuous; paraphyses none; teliospores oblong-terete, or somewhat obovate-terete, 28–31 by 80–95 μ, usually not narrowed above or below, strongly rostrate, 5–7-celled; wall chestnut-brown, not very opaque, moderately thick, 3–5 μ, closely and finely verrucose especially above, usually almost or quite smooth below, the apical projection prominent, conical, 14–16 μ long, colored and roughened like the upper cell, except the extreme end which is hyaline and smooth; pedicel once and a half length of spore, the upper half colored next to the spore, 8–10 μ in diameter, the lower half colorless, not usually narrowed downward, swelling in water, 15–20 μ in diameter.

ON ROSACEAE:
Rosa Eglanteria L. (*R. lutea* Mill.), Massachusetts, Nebraska.
Rosa hemisphaerica Herrm. (*R. sulphurea* Ait.), Nebraska.
Rosa rubiginosa L. (*R. Eglanteria* Mill.), Nebraska, New York.
Rosa spinosissima L. (*R. pimpinellifolia* L.), West Virginia.
Rosa sp. cult., Indiana, Vermont.
TYPE LOCALITY: Germany, on *Rosa pimpinellifolia*.

DISTRIBUTION: Northern United States east of the Rocky mountains, on cultivated roses, especially those having small leaflets; also in Europe and Australia.

EXSICCATI: Barth. Fungi Columb. *2545*.

ILLUSTRATIONS: Jul. Müll. Rostpilze (Inaug.-Diss.) *pl. 1, f. 1–3;* McAlpine, Rusts Austr. *pl. I, f. 37; pl. 26, f. 229–233*.

13. **Phragmidium Andersoni** Shear, Bull. Torrey Club **29**: 453. 1902.

O. Pycnia not seen.

I. Aecia hypophyllous, usually scattered singly, round, 0.3–0.4 mm. across, pulvinate, bright-orange fading to pale-yellow, ruptured epidermis not conspicuous; paraphyses rather few and not conspicuous, surrounding each individual sorus, slightly incurved, scarcely equaling the height of the spore-mass, clavate, 10–18 by 45–64 μ, the wall thin, 1–1.5 μ, usually thicker at apex, 2–3 μ, nearly or quite colorless, smooth; aeciospores broadly ellipsoid, 15–20 by 21–26 μ; wall pale-yellow, moderately thin, 1.5–2 μ, rather coarsely and closely verrucose with irregular papillae.

II. Uredinia chiefly hypophyllous, scattered, round, small, 0.1–0.3 mm. across, early naked, ruptured epidermis inconspicuous; paraphyses encircling the sorus, abundant and conspicuous, strongly incurved, slightly clavate, 6–13 by 45–64 μ, the wall thin, about 1 μ, slightly thicker on the upper side of curve toward apex, 1.5–2 μ, nearly or quite colorless, smooth; urediniospores globoid or broadly ellipsoid, 16–22 by 19–26 μ; wall pale-yellow, moderately thick, 1.5–2.5 μ, closely and rather finely verrucose.

III. Telia amphigenous, numerous, scattered, irregular in outline, 0.2–0.5 mm. across, early naked, slightly pulvinate, blackish-brown, surrounding epidermis inconspicuous; paraphyses none; teliospores cylindrical, 25–35 by 44–74 μ, rounded above and below, 3–5-celled; wall blackish-brown, often nearly opaque, moderately verrucose, the apex usually with a small, blunt, rounded hyaline papilla; pedicel rugose when dry especially below, about once and a half length of spore, the upper half colorless except near spore, 7–10 μ in diameter, the lower part colorless, swelling in water to lanceolate, 15–20 μ at the broadest diameter.

ON ROSACEAE:

Dasiphora fruticosa (L.) Rydb. (*Potentilla fruticosa* L.), California, Colorado, Iowa, New York, Utah, Wyoming; Alberta, British Columbia, New Brunswick, Ontario.

TYPE LOCALITY: Big Horn Mountains, Wyoming, on *Potentilla fruticosa*.

DISTRIBUTION: New York, Colorado, northern California, and northward in the United States, and across Canada from the Atlantic to the Pacific; also in Europe.

EXSICCATI: Clements, Crypt. Form. Colo. *585;* Barth. Fungi Columb. *2542;* Barth. N. Am. Ured. *11;* D. Griff. W. Am. Fungi *319, 319a;* Sydow, Ured. *1834;* Vesterg. Micr. Rar. Sel. *1011*.

14. **Phragmidium Jonesii** Dietel, Hedwigia **44**: 128. 1905.

O. Pycnia amphigenous, few, gregarious, inconspicuous, subcuticular, light-yellow, hemispherical, 65–128 μ broad by 25–45 μ high.

I. Aecia amphigenous, oval, sometimes confluent, 0.3–0.5 mm. broad by 0.8–2 mm. long, bright-yellow fading to pale-yellow, ruptured epidermis usually conspicuous; paraphyses few or none; aeciospores ellipsoid to obovate, 15–18 by 21–26 μ; wall pale-yellow, thin, 1–1.5 μ, finely verrucose.

II. Uredinia amphigenous, scattered, orbicular, 0.2–0.5 mm. across, ruptured epidermis usually not conspicuous; paraphyses numerous, encircling the sorus, somewhat incurved, cylindrical to clavate, colorless, 10–13 by 45–60 μ, the wall uniformly thin, 1 μ; urediniospores obovate or ellipsoid, 13–19 by 18–26 μ; wall light-yellow to colorless, 1.5–2 μ thick, verrucose-echinulate, the pores several, scattered, usually noticeable.

III. Telia amphigenous, confluent, of irregular outline, 0.5–0.7 mm. across, ruptured epidermis not conspicuous; teliospores cylindrical, variable, 21–27 by 50–95 μ, narrowed somewhat above and below, 4–10- (mostly 5–8-) celled, the pores 2 or 3 in each cell, usually 3; wall dark chestnut-brown to blackish, 2.5–5 μ thick, rather coarsely verrucose, less so below, lower cells often smooth, the apex with a subhyaline blunt conical papilla, 3–10 μ; pedicel about length of spore, 45–100 μ, the upper part colorless except near spore, 7–10 μ in diameter, the lower part colorless, swelling in water, 18–35 μ at broadest diameter, cylindrical to clavate.

ON ROSACEAE:
Ivesia Baileyi S. Wats., Oregon.
Ivesia Gordonii (Hook.) T. & G., Utah.
Ivesia setosa (S. Wats.) Rydb. (*I. Baileyi setosa* S. Wats.), Nevada.
TYPE LOCALITY: Glencoe, Nevada, on "*Ivesia Baileyi*," now determined as *I. setosa*.
DISTRIBUTION: Central plateau of the Rocky mountains.

15. **Phragmidium Ivesiae** Sydow, Ann. Myc. **1**: 329. 1903.

Uredo Acaenae Ellis & Ev. N. Am. Fungi *3150*, hyponym. 1894.
Phragmidium affine Sydow, Ann. Myc. **2**: 29. 1904.

O. Pycnia not seen.

I. Aecia hypophyllous, scattered, roundish or oval, 0.4–1 mm. across, becoming slightly pulverulent, bright orange-yellow fading to pale-yellow, ruptured epidermis not noticeable; paraphyses wanting; aeciospores broadly ellipsoid or globoid, 18–20 by 20–26 μ; wall pale-yellow, rather thin, 1.5–2 μ, finely and very sparsely echinulate-verrucose with well separated papillae, the pores indistinct, scattered, about 4 or more.

II. Uredinia hypophyllous, numerous, scattered, round, 0.7–1 mm. across, soon naked, yellowish, ruptured epidermis not conspicuous; paraphyses very few, small, clavate, thin-walled, colorless, encircling the sorus, often entirely wanting; urediniospores broadly ellipsoid or subglobose, 16–22 by 19–26 μ; wall pale-yellow, moderately thin, 1.5–2 μ, rather finely and sparingly verrucose-echinulate, the pores not distinct, scattered, 4 or more.

III. Telia hypophyllous, at first arising from the uredinia, numerous, scattered, roundish or often irregular, 0.4–1.5 mm. across, soon naked, blackish-brown, ruptured epidermis inconspicuous; paraphyses none; teliospores short-cylindrical, 19–26 by 35–51 μ, usually rounded at both apex and base, usually 3- (sometimes 2- or 4-) celled; wall chocolate-brown, 2.5–3.5 μ thick, smooth throughout or more often minutely verrucose on the upper part about the apex; pedicel colorless except close to the spore, 5–9 μ in diameter, usually short, occasionally as long as spore, slightly attenuate below.

ON ROSACEAE:
Acaena tridactyla Presl (*A. trifida* Torr. not R. & P.), California.
Ivesia sericoleuca Rydb., California.
Potentilla Bakeri Rydb., Colorado.
Potentilla Blaschkeana Turcz., California, Montana.
Potentilla diversifolia Lehm., Alberta.
Potentilla Elmeri Rydb., California.
Potentilla fastigiata Nutt., Colorado.
Potentilla filipes Rydb. (*P. gracilis* Port. & Coult., *P. pulcherrima* Rydb.), Colorado, Nevada, Utah, Wyoming.
Potentilla flabelliformis Lehm., Idaho, Washington.
Potentilla glaucophylla Lehm., Colorado.
Potentilla glomerata A. Nels., Montana, Oregon.
Potentilla grosse-serrata Rydb., California.
Potentilla Hallii Rydb., California.
Potentilla Hippiana Lehm., Assiniboia.
Potentilla monspeliensis L., Colorado.
Potentilla Nuttallii Lehm., Colorado, Montana, Wyoming; Alberta.
Potentilla paradoxa Nutt., Iowa, Nebraska, South Dakota.
Potentilla pulcherrima Lehm., Utah.
Potentilla rubripes Rydb., Montana.
Potentilla viridescens Rydb., Montana, Utah.

TYPE LOCALITY: California, on "*Ivesia unguiculata*," now considered to be *I. sericoleuca*.
DISTRIBUTION: Mountainous regions from central California and Colorado northward, and occasionally on the plains from Nebraska and western Iowa northward into Canada.
EXSICCATI: Clements, Crypt. Form. Colo. *584*; Sydow, Ured. *1787*, *1947*; D. Griff. W. Am. Fungi *51*, *51a*, *51b*, *281*; Garrett, Fungi Utah. *100*, *151*; Ellis, N. Am. Fungi *1066*; Ellis & Ev. N. Am. Fungi *2881*, *3150*; Ellis & Ev. Fungi Columb. *561*, *759*, *1946*; Vesterg. Micr. Rar. Sel. *952*.

16. **Phragmidium Potentillae** (Pers.) P. Karst. Bidr. Finl. Nat. Folk **31**: 49. 1879.

Puccinia Potentillae Pers. Syn. Fung. 229. 1801.
Uredo Potentillae Schum. Enum. Pl. Saell. **2**: 228. 1803.
Aregma obtusata Fries, Obs. Myc. **1**: 225, in part. 1815.
Phragmidium obtusum Schmidt & Kunze, Deuts. Schwämme **5**: 5. 1816.
Caeoma Potentillae Schlecht. Fl. Berol. **2**: 121. 1824.

O. Pycnia amphigenous, few, gregarious and often confluent, in small groups usually surrounded by the aecia, inconspicuous, subcuticular, extending somewhat into the lateral walls of the epidermal cells, pale-yellow, discoidal, low, 100–160 μ in diameter by 25–40 μ high.

I. Aecia amphigenous, solitary or confluent in annular groups, 0.5–2 mm. across, roundish or oval, applanate, orange-yellow fading to pale-yellow, ruptured epidermis conspicuous; paraphyses not abundant nor conspicuous, surrounding each individual sorus, erect, not much exceeding the height of the spore-mass, cylindrical or slightly clavate, 6–8 by 40–55 μ, the wall evenly thin, 1 μ, nearly or quite colorless, smooth; aeciospores globoid or broadly ellipsoid, 18–23 by 23–26 μ; wall nearly colorless, moderately thin, 1.5–2 μ, rather sparsely and finely verrucose, the pores noticeable, scattered.

II. Uredinia hypophyllous, scattered, roundish, 0.5–1 mm. across, soon naked, becoming pulverulent, ruptured epidermis not noticeable; paraphyses encircling the sorus, rather numerous, broadly clavate, mostly erect, 12–20 by 50–80 μ, the wall evenly thin, 1 μ or less, nearly or quite colorless, smooth; urediniospores obovate or ellipsoid, 15–21 by 19–26 μ; wall pale-yellow, moderately thin, 1.5–2 μ, rather sparsely verrucose-echinulate, the pores not distinct, scattered, about 8.

III. Telia chiefly hypophyllous, numerous, scattered, roundish, 0.5–1 mm. across, pulvinate, blackish, early naked, ruptured epidermis not noticeable; paraphyses none; teliospores cylindrical, 23–30 by 48–89 μ, rounded below, rounded or often somewhat acutish above, usually slightly constricted at the septa, 3–5-celled; wall chocolate-brown, 3–4 μ thick, sometimes thicker at apex, 5–10 μ, smooth; pedicel colorless, somewhat rugose when dry especially in the lower part, about 7–10 μ in diameter, once or twice length of spore or more, the lower part usually swelling slightly in water.

ON ROSACEAE:
Potentilla arachnoidea Dougl., Colorado.
Potentilla bipinnatifida Dougl., Montana, North Dakota.
Potentilla glabrella Rydb., Manitoba.
Potentilla monspeliensis L. (*P. norvegica* A. Gray, not L.), Maine.
Potentilla pectinata Raf. (*P. litoralis* Rydb.), Maine; Newfoundland.
Potentilla pennsylvanica L., Assiniboia, Manitoba.
Potentilla strigosa Pall., Colorado, Montana, Nebraska, New Mexico, North Dakota, South Dakota; Alberta, Manitoba.

TYPE LOCALITY: Europe, on *Potentilla argentea*.

DISTRIBUTION: Atlantic coast from Maine northeastward to Newfoundland, and plains along the eastern border of the Rocky mountains from New Mexico northward to Manitoba and Alberta; also in Europe.

ILLUSTRATIONS: Beitr. Krypt. Schweiz 2^2: *f. 286*; Corda, Ic. Fung. **4**: *pl. 5, f. 72*.

EXSICCATI: Ellis & Ev. N. Am. Fungi *2256*; Clements, Crypt. Form. Colo. *328*; Brenckle, Fungi Dak. *6*; Sydow, Ured. *2283*; Barth. N. Am. Ured. *116*.

17. EARLEA Arth. Résult. Sci. Congr. Bot. Vienne 341. 1906.

Cycle of development includes pycnia, aecia, and telia, with distinct alternating phases; autoecious. Pycnia subcuticular, other sori subepidermal.

Pycnia conoidal or much flattened and extending downward between the epidermal cells; hymenium flat; ostiolar filaments wanting.

Aecia erumpent, usually indefinite, encircling paraphyses usually inconspicuous or wanting. Aeciospores catenulate, ellipsoid; wall colorless, verrucose with fine or coarse beads.

Telia erumpent, more or less indefinite, without paraphyses. Teliospores two- to several-celled by transverse septa, smooth or verrucose; wall somewhat laminate, colored, hygroscopic layer obscure, pores two or three in each cell, lateral; pedicels hyaline, firm, of nearly uniform diameter.

Type species, *Aregma speciosa* Fries (on *Rosa carolina*).

Teliosporic pedicel much longer than spore.
  Teliospores 4-celled or more.
    Teliospores smooth. 1. *E. speciosa*.
    Teliospores verrucose. 2. *E. alaskana*.
  Teliospores less than 4-celled. 3. *E. Horkeliae*.
Teliosporic pedicel much shorter than spore. 4. *E. bilocularis*.

1. Earlea speciosa (Fries) Arth. Résult. Sci. Congr. Bot. Vienne 341. 1906.

Aregma speciosa Fries, Syst. Myc. **3**: 496. 1832.
Seiridium marginatum Schw. Trans. Am. Phil. Soc. II. **4**: 306. 1832. Not *S. marginatum* Nees, 1816.
Seiridium Smilacis Schw. Trans. Am. Phil. Soc. II. **4**: 306. 1832.
Phragmidium speciosum Cooke, Grevillea **3**: 171. 1875.

O. Pycnia chiefly epiphyllous and caulicolous, crowded in considerable groups, often confluent, inconspicuous, subcuticular, extending well into the lateral walls of the epidermal cells, pale honey-yellow, flattened-conoidal or discoidal, 65–160 μ in diameter by 35–50 μ high.

I. Aecia hypophyllous and caulicolous, usually on swollen and distorted areas of more or less extent, roundish, 0.5–1 mm. across, on leaves forming small groups, on petioles, stems and fruit confluent into irregular groups 10 mm. or more long, applanate, bright orange-yellow fading to pale-yellow, ruptured epidermis usually conspicuous; paraphyses at first often rudimentary or wanting, in senile sori peripheral, usually few, erect, finally somewhat exceeding the height of the spore-mass, slender, clavate or cylindrical, 9–13 by 42–50 μ, the wall almost evenly thin, 1 μ or less, colorless; aeciospores oblong-elliptical, obovate, rarely oblong-clavate, 16–24 by 24–35 μ; wall pale-yellow, rather thin, 1–2 μ, distinctly echinulate-verrucose with pointed beads standing 1 μ apart, the pores indistinct, scattered.

III. Telia caulicolous, gregarious, crowded, oblong, about 1 mm. long, usually more or less confluent and 10–30 mm. long causing a somewhat fusiform hypertrophy, at first crust-like, with age becoming felty, grayish-black; teliospores cylindrical, 21–27 by 58–102 μ, rounded at both ends, except a semi-hyaline apiculus above 3–7 μ long and nearly as broad, 4–8-celled; walls smoky-brown, 3–5 μ thick, smooth, the pores 2 or sometimes 3 in each cell; pedicel three to five times length of spore, slightly tinted especially near the spore, 7–9 μ in diameter, usually tapering in lower part, nearly or quite solid due to thickened walls, somewhat rugose near base.

ON ROSACEAE:
Rosa blanda Ait., Iowa, New York, Wisconsin; Nova Scotia.
Rosa carolina L. (*R. corymbosa* Ehrh.), Indiana, Massachusetts, North Carolina.
Rosa Fendleri Crépin, Colorado.
Rosa foliosa Nutt., Texas.
Rosa humilis Marsh., Alabama, Indiana, Kentucky, Mississippi, Missouri, New York, Vermont.
Rosa Macounii Greene, Colorado.
Rosa Maximiliani Nees (*R. Woodsii* S. Wats. not Lindl.), Kansas, Nebraska, South Dakota.
Rosa pecosensis Cockerell, New Mexico.
Rosa pisocarpa A. Gray, Washington.
Rosa heliophila Greene (*R. arkansana* S. Wats. not Porter, *R. pratincola* Greene), Iowa, Kansas, Minnesota, Nebraska, North Dakota, South Dakota.
Rosa rugosa Thunb., South Dakota, Wisconsin.
Rosa Sayi Schw., Colorado.
Rosa virginiana Mill. (*R. lucida* Ehrh.), Connecticut, New Jersey; Nova Scotia.
Rosa sp. cult., Connecticut, Iowa, New Jersey, Wisconsin.

TYPE LOCALITY: North America [North Carolina], on *Rosa corymbosa*.

DISTRIBUTION: Throughout the United States and southern Canada, most abundant in the prairie regions of the Mississippi valley.

EXSICCATI: Ellis, N. Am. Fungi *281*; Ellis & Ev. Fungi Columb. *494*; Barth. Fungi Columb. *2248*, *2544*, *2647*; Brenckle, Fungi Dak. *53*, *53a*; Rav. Fungi Car. **3**: *90*; Thüm. Myc. Univ. *247*; Kellerm. & Swingle, Kan. Fungi *14*; Seym. & Earle, Econ. Fungi *37*; Sydow, Ured. *1291*, *2285*; D. Griff. W. Am. Fungi *12*, *12a*, *12b*; Rab.-Wint. Fungi Eur. *3707a*, *b*, *3610*.

2. **Earlea alaskana** Arthur, sp. nov.

O. Pycnia unknown.

I. Aecia amphigenous, indefinite, irregular, elongate on the veins and stems, bullate, 0.3–0.5 by 0.5–1.5 mm., often confluent into irregular groups, gradually becoming naked, pulverulent, pale-yellow upon drying, ruptured epidermis conspicuous; paraphyses peripheral, rather numerous, somewhat incurved, not much exceeding the height of the spore-mass, cylindrical or clavate, 10–13 by 50–65 μ, the wall thin, 1–1.5 μ, thicker above, 4–6 μ, colorless, smooth; aeciospores ellipsoid, 15–20 by 20–28 μ; wall nearly colorless, thin, 1–1.5 μ, thickly and coarsely verrucose with low and slightly irregular beads, the pores indistinct, scattered.

III. Telia not available for study, seemingly hypophyllous; teliospores too few to supply full characters, cylindrical, 26–31 by 79–108 μ, rounded at both ends, except a prominent, conical apiculus 5–10 μ long, 6–8- (usually 7-) celled, slightly or not constricted at the septa; wall blackish or chocolate-brown, 2.5–3.5 μ thick, unevenly and rather finely verrucose,

the pores generally 3 in each cell; pedicel once to once and a half length of spore, somewhat tinted in upper part, nearly or quite solid, of uniform diameter, 7–9 μ, not swelling below.

ON ROSACEAE:
Rubus stellatus Smith, Alaska.
Type collected at Disenchantment Bay, Alaska, June 19, 1899, *William Trelease 670.*

3. **Earlea Horkeliae** (Garrett) Arthur.

Phragmidium Horkeliae Garrett, Fungi Utah. *112.* 1907.

O and I. Pycnia and aecia unknown.

III. Telia amphigenous, numerous, scattered, sometimes confluent, roundish or oval, 0.5–2 mm. across, on discolored spots occupying part or all of a leaflet, rather tardily naked, pulvinate, blackish-brown, ruptured epidermis very conspicuous; teliospores ellipsoid, 23–27 by 37–58 μ, usually rounded below, rounded or often narrowed above, slightly or not constricted at the septa, mostly 2- (rarely 1- or 3-) celled; wall light chocolate-brown, about 1.5–2.5 μ thick, slightly thicker above, 3–5 μ, inconspicuously and sparsely verrucose, often appearing smooth, the pores 2 in each cell; pedicel nearly or quite colorless, two to three times length of spore or more, 3–5 μ in diameter, uniform, or tapering downward, somewhat rugose at base.

ON ROSACEAE:
Ivesia Gordonii (Hook.) T. & G. (*Horkelia Gordonii* Hook.), Utah.
TYPE LOCALITY: Big Cottonwood Canyon, Salt Lake County, Utah, on *Horkelia Gordonii.*
DISTRIBUTION: Known only from Salt Lake County, Utah.
EXSICCATI: Garrett, Fungi Utah. *112.*

4. **Earlea bilocularis** (Dietel & Holway) Arthur.

Phragmidium biloculare Dietel & Holway; Dietel, Bot. Gaz. **19**: 305. 1894.
Gymnoconia bilocularis Arth. Résult. Sci. Congr. Bot. Vienne 342. 1906.

O. Pycnia not seen.

I. Aecia hypophyllous and caulicolous, somewhat grouped or scattered, on indefinite discolored spots, roundish, 0.5–1 mm. across, soon naked, orange-yellow fading to pale-yellow, somewhat pulverulent, ruptured epidermis rather conspicuous; aeciospores globoid or elliptical-globoid, 18–21 by 20–30 μ; wall colorless, rather thin, 1.5–2 μ, verrucose with small, distinct beads.

III. Telia hypophyllous and caulicolous, at first arising beside the aecia, afterward independent, scattered irregularly, at first covered by the membranous epidermis, soon naked, roundish or oblong, 0.5 mm. across, somewhat pulverulent, dull chestnut-brown, ruptured epidermis noticeable; teliospores ellipsoid, 19–26 by 30–40 μ, rounded at both ends, not constricted at septa, mostly 2- (rarely 3-) celled; wall cinnamon-brown, uniformly thick, 3–4 μ, closely verrucose with rather large, colorless tubercles, swelling somewhat in water, the pores obscure, usually 3 in each cell; pedicel nearly colorless, firm, tapering downward, rather short, about length of spore.

ON ROSACEAE:
Potentilla flabellifolia Hook. (*P. gelida* S. Wats.), Washington.
TYPE LOCALITY: Chiquash Mountains, Skamania County, Washington, on *Potentilla gelida.*
DISTRIBUTION: Known only from the state of Washington.

18. **TRACHYSPORA** Fuckel, Bot. Zeit. **19**: 250. 1861.

Cycle of development imperfectly known; only uredinia and telia recognized, both subepidermal, but judging from analogy also possessing subcuticular pycnia.

Uredinia erumpent, somewhat indefinite, without peridium or paraphyses. Urediniospores borne singly on pedicels, globoid; wall thin, pale or colorless, verrucose, the pores obscure.

Telia erumpent, often first arising from the uredinia, usually definite, without paraphyses. Teliospores free, one-celled, more or less coarsely verrucose; wall somewhat laminate, colored, hygroscopic layer and pores obscure; pedicels hyaline, not hygroscopic.

Type species, *Uredo Alchemillae* Pers. (on *Alchemilla vulgaris*).

1. **Trachyspora Alchemillae** (Pers.) Fuckel, Bot. Zeit. **19**: 250. 1861.

Uredo Alchemillae Pers. Obs. Myc. 1: 98. 1796.
Uredo polymorpha Alchemillae Strauss, Ann. Wett. Ges. 2: 86. 1810.
Uredo intrusa Grev. Fl. Edin. 436. 1824.
Erysibe Alchemillae Wallr. Fl. Crypt. Germ. 2: 199. 1833.
Uromyces intrusus Lév. Ann. Sci. Nat. III. 8: 376. 1847.
Caeoma asperum Bon. Abh. Nat. Ges. Halle 8: 87. 1864.
Uromyces Alchemillae Wint. in Rab. Krypt.-Fl. 1^1: 146. 1881.

O. Pycnia unknown.

II. Uredinia hypophyllous, thickly scattered over large areas, roundish or oblong, 0.2–0.5 mm. across, sometimes confluent, soon naked, pulverulent, orange-yellow, ruptured epidermis conspicuous; urediniospores globoid, small, 16–21 by 19–24 μ; wall nearly colorless, thin, 1 μ, closely and finely verrucose, the pores scattered, obscure.

III. Telia hypophyllous, at first arising from the uredinia, round, 0.2–0.5 mm. across, soon naked, cinnamon-brown, ruptured epidermis evident; teliospores globoid or broadly ellipsoid, 22–30 by 22–40 μ; wall cinnamon-brown, thick, 3–4 μ or more, coarsely and unevenly verrucose, or sometimes nearly or partially smooth; pedicel colorless, once length of spore or less, fragile, partially deciduous.

ON ROSACEAE:
Alchemilla pratensis F. W. Schmidt, Greenland.
TYPE LOCALITY: Europe, on *Alchemilla vulgaris*.
DISTRIBUTION: Greenland; also in Europe.
ILLUSTRATION: Beitr. Krypt. Schweiz 2^2: *f. 34*.

19. **TRIPHRAGMIUM** Link, in Willd. Sp. Pl. 6^2: 84. 1825.

Cycle of development includes pycnia, uredinia, and telia, with distinct alternating phases; autoecious. Pycnia subcuticlar, other sori subepidermal.

Pycnia subcuticular, flattish; ostiolar filaments wanting.

Uredinia erumpent, of two distinct sorts, the primary form, resulting from telial infection, indefinite, the secondary form definite, small, encircled by paraphyses. Urediniospores borne singly on pedicels; wall nearly colorless, echinulate, the pores obscure.

Telia erumpent, more or less definite. Teliospores free, triangularly three-celled with oblique partitions; walls colored, verrucose, the pores usually one in a cell and apical, *i. e.*, equidistant from septa.

Type species, *Triphragmium Ulmariae* Link (on *Ulmaria* sp.).

1. **Triphragmium Ulmariae** (Schum.) Link, in Willd. Sp. Pl. 6^2: 84. 1825.

Uredo Ulmariae Schum. Enum. Pl. Saell. 2: 227. 1803.
Uredo Spiraeae Sow. Engl. Fungi *pl. 398*. 1803.
Puccinia Ulmariae Hedw. f.; Poir. in Lam. Encyc. 8: 245. 1808.
Uredo effusa Ulmariae Strauss, Ann. Wett. Ges. 2: 91. 1810.
Coleosporium Spiraeae P. Karst. Not. Sällsk. Faun. Fl. Fenn. Förh. 8: 222. 1866.
Caeoma Ulmariae Thüm. Bull. Soc. Nat. Mosc. 53^1: 220. 1878.

O. Pycnia epiphyllous, few, flat, reddish-yellow, inconspicuous, subcuticular involving the lateral walls of the epidermal cells, about 350 μ broad by 60 μ high.

II. Uredinia at first (primary) amphigenous, more abundant below, indefinitely and irregularly extended, large, 3–5 mm. broad by 5–15 mm. long, usually on the veins and petioles causing hypertrophy and discoloration, soon naked, slightly pulverulent, bright orange-yellow fading to pale-yellow, ruptured epidermis conspicuous; paraphyses none: uredinia afterward (secondary) hypophyllous and chiefly on the mesophyl, definite, round, small, 0.5 mm. across, not causing hypertrophy, soon naked, very pulverulent, lemon-yellow; paraphyses encircling the sori, cylindrical, 8–15 by 32–50 μ, the wall colorless, thin, less than 1 μ; urediniospores broadly ellipsoid, or obovate, 18–24 by 25–33 μ; wall nearly colorless, moderately thick, 1.5–3 μ, sparsely echinulate with low, conical points becoming smaller and inconspicuous at base, the pores scattered, very obscure.

III. Telia caulicolous and hypophyllous, arising at first from uredinial sori, on hard tissues large, up to 15 mm. long, on soft tissues small, round, 0.5 mm. across, soon naked, pulverulent, chestnut-brown, ruptured epidermis noticeable ; teliospores laterally flattened, seen flatwise discoid or triangular, seen edgewise obovate, 30–45 by 35–48 μ, rounded above and below, slightly or not constricted at the septa, 3-celled, one cell below and two cells above, all of nearly equal size; wall chestnut-brown, moderately thick, 1.5–2.5 μ, irregularly verrucose with hyaline beads, especially about the pores; pedicel colorless, once to once and a half length of spore, fragile, largely deciduous.

ON ROSACEAE :
Filipendula rubra (Hill) B. L. Robinson (*Spiraea lobata* Gron., *S. rubra* Britton, *Ulmaria rubra* Hill), Indiana.
TYPE LOCALITY : Island of Zealand, Denmark, on *Spiraea Ulmaria*.
DISTRIBUTION : Lafayette, Indiana, in one locality of less than a half hectare extent; also in Europe and Japan.
ILLUSTRATIONS : Plow. Brit. Ured. Ustil. *pl. 4, f. 6 ;* Beitr. Krypt. Schweiz 2^2 : *f. 293*.
EXSICCATI : Barth. N. Am. Ured. *83*.

20. **AMERIS** Arth. Résult. Sci. Congr. Bot. Vienne 342. 1906.

Cycle of development includes telia, and possibly pycnia.

Telia subepidermal, erumpent, somewhat indefinite. Teliospores free, one-celled; wall colored, somewhat laminate, hygroscopic layer obscure, verrucose, the pores 2 or more, lateral.

Type species, *Uromyces rosicola* Ellis & Ev. (on *Rosa Engelmanni*).

1. **Ameris rosicola** (Ellis & Ev.) Arth. Résult. Sci. Congr. Bot. Vienne 342. 1906.

Uromyces rosicola Ellis & Ev. Am. Nat. 31 : 427. 1897.

O. Pycnia unknown, probably not formed.

III. Telia hypophyllous, usually crowded over the whole under surface of the leaflets, confluent, irregular and often tortuous, long covered by the epidermis, dark chestnut-brown, ruptured epidermis very conspicuous ; teliospores globoid, 29–34 by 32–39 μ; wall dark chestnut-brown, 2–3 μ thick, very coarsely and rather unevenly verrucose with closely set, semi-hyaline beads ; pedicel colorless except close to spore, about length of spore or shorter, stout, 7–10 μ in diameter, somewhat attenuate downwards, the pores obscure, 2 or 3, lateral.

ON ROSACEAE :
Rosa Engelmanni S. Wats., Nebraska.
TYPE LOCALITY : Crawford, Nebraska, on "*Rosa Fendleri?*," now determined as *R. Engelmanni*.
DISTRIBUTION : Plains of northwestern Nebraska.

21. **NYSSOPSORA** Arth. Résult. Sci. Congr. Bot. Vienne 342. 1906.

Cycle of development includes telia, and possibly pycnia.

Telia subepidermal, erumpent. Teliospores triangularly three-celled by oblique partitions, laterally flattened; walls colored, spinous, the pores two in a cell, lateral, usually near the inner angles.

Type species, *Triphragmium echinatum* Link (on *Meum athamanticum*).

Telia amphigenous, irregular, large, 0.7–3 mm. or more across. 1. *N. echinata*.
Telia epiphyllous, roundish, small, 0.3–0.7 mm. across. 2. *N. clavellosa*.

1. **Nyssopsora echinata** (Lév.) Arth. Résult. Sci. Congr. Bot. Vienne 342. 1906.

Triphragmium echinatum Lév. Ann. Sci. Nat. III. 9 : 247. 1848.

O. Pycnia unknown, possibly not formed.

III. Telia amphigenous, numerous, irregular, 0.7–3 mm. or more across, early naked, slightly pulverulent, somewhat pulvinate, blackish, ruptured epidermis conspicuous ; teliospores laterally flattened, seen flatwise orbicular or somewhat triangular, 26–31 by 29–34 μ,

seen edgewise ellipsoid, 20–23 μ thick, slightly or not at all constricted at the septa, the three cells of about equal size; wall dark chocolate-brown, moderately thick, 1.5–2.5 μ, rather thickly covered, except on the flattened sides, with large spines 6–13 μ long, 1.5–2 μ in diameter, gradually attenuate away from the spore, usually minutely branched or forked at the ends, the pores 2 in a cell, lateral, usually near the inner angles; pedicel colorless, short, deciduous.

ON AMMIACEAE:
Ligusticum Cusickii Coult. & Rose, Oregon.
Ligusticum Porteri Coult. & Rose, New Mexico.
Ligusticum purpureum Coult. & Rose, Washington.
Ligusticum scopulorum A. Gray, Colorado.
Oenanthe californica S. Wats., California.
Oenanthe sarmentosa Presl, Washington.
Selinum pacificum S. Wats., California.
TYPE LOCALITY: Mende, France, on *Meum athamanticum*.
DISTRIBUTION: Mountainous region of western United States; also in Europe and Japan.
ILLUSTRATION: Beitr. Krypt. Schweiz 2^2: *f. 292*.
EXSICCATI: Ellis, N. Am. Fungi *1064*; Ellis & Ev. Fungi Columb. *178*; Barth. Fungi Columb. *2286*; D. Griff. W. Am. Fungi *340*; Seym. & Earle, Econ. Fungi Suppl. *B 24*; Sydow, Ured. *889*.

2. **Nyssopsora clavellosa** (Berk.) Arthur.

Triphragmium clavellosum Berk. Gard. Chron. 1857: 21. 1857.

O. Pycnia unknown, possibly not formed.

III. Telia epiphyllous, numerous, usually gregarious, crowded in orbicular or sometimes irregular groups 1–5 mm. across, on larger discolored, areas, rarely scattered, roundish 0.3–0.7 mm. in diameter, sometimes confluent, rather early naked, pulvinate, brownish-black, ruptured epidermis conspicuous; teliospores laterally flattened, seen flatwise orbicular or somewhat triangular, 26–31 μ in diameter, seen edgewise ellipsoid, 19–23 μ thick, slightly constricted at the septa, the three cells of about equal size; wall brownish-black, often almost opaque, moderately thin, 1.5–2 μ, covered rather sparingly except on the flattened sides with large spines, 7–12 μ long, 1–2 μ in diameter, slightly attenuate away from the spore, minutely forked or branched at the ends, the pores 2 in a cell, lateral, usually near the inner angles; pedicel colorless, once to twice length of spore, 7–9 μ in diameter.

ON ARALIACEAE:
Aralia nudicaulis L., Maine, Michigan, Minnesota, New Hampshire, New York, Vermont, Wisconsin; New Brunswick, Newfoundland, Nova Scotia, Ontario, Quebec.
TYPE LOCALITY: Montreal, Canada, on "*Prunus* sp." error for *Aralia nudicaulis*.
DISTRIBUTION: Maine to central New York and northern Minnesota, northward into Newfoundland and Canada; also in Europe and Japan.
EXSICCATI: Ellis, N. Am. Fungi *1063*; Thüm. Myc. Univ. *844*; Seym. & Earle, Econ. Fungi Suppl. *B 23a*, *B 23b*; Sydow, Ured. *1536*; Vesterg. Micr. Rar. Sel. *653*; Rab.-Wint. Fungi Eur. *2918*; Barth. N. Am. Ured. *183*.

22. **GYMNOCONIA** Lagerh. Tromsö Mus. Aarsh. **16**: 140. 1894.

Cycle of development includes pycnia, aecia, and telia, with distinct alternating phases; autoecious. Pycnia subcuticular, other sori subepidermal.

Pycnia semi-columnar, without ostiolar filaments.

Aecia erumpent, indefinite, usually crowded thickly over large areas, without peridia or paraphyses. Aeciospores catenulate, globoid or ellipsoid; wall colorless, finely verrucose.

Telia erumpent, definite. Teliospores free, ellipsoid to ovoid, two-celled; wall colored, smooth, or nearly so, the pores one in a cell, apical, or sometimes lateral in the lower cell; pedicels short, deciduous.

Type species, *Caeoma interstitiale* Schlecht. (on *Rubus arcticus*).

Aeciospores subgloboid or broadly ellipsoid, the wall thin, 1.5 μ. — 1. *G. interstitialis*.
Aeciospores ovoid or ellipsoid, the wall thick, 2.5–3.5 μ. — 2. *G. Rosae-gymnocarpae*.

1. **Gymnoconia interstitialis** (Schlect.) Lagerh. Tromsö Mus. Aarsh. **16**: 140. 1894.

Caeoma (*Uredo*) *interstitiale* Schlecht. Horae Phys. Berol. 96. 1820.
Uredo interstitialis Schlecht. Horae Phys. Berol. 96. 1820.
Aecidium nitens Schw. Schr. Nat. Ges. Leipsig 1: 69. 1822.

Caeoma luminatum Link, in Willd. Sp. Pl. 6²: 61. 1825.
Puccinia Peckiana Howe; Peck, Ann. Rep. N. Y. State Mus. **23**: 57. 1872.
Puccinia tripustulata Peck, Ann. Rep. N. Y. State Mus. **24**: 91. 1872.
Caeoma nitens Burrill, Bull. Ill. Lab. Nat. Hist. **2**: 220. 1885.
Uredo (*Caeoma*) *nitens* De-Toni, in Sacc. Syll. Fung. **7**: 866. 1888.
Puccinia interstitialis Tranz. Hedwigia **32**: 259. 1893.
Dicaeoma tripustulatum Kuntze, Rev. Gen. 3³: 467. 1898.

O. Pycnia chiefly epiphyllous, scattered, noticeable, honey-yellow becoming brownish, columnar, projecting rather far above the surface of the epidermis, 87–100 μ high by 50–80 μ in diameter.

I. Aecia chiefly hypophyllous, from a perennial mycelium, usually thickly crowded, occupying part or all of the under surface of the leaflets, irregular, 0.5–1.5 mm. across, often confluent and tortuous, applanate, soon naked, bright orange-yellow, ruptured epidermis conspicuous; aeciospores subgloboid or broadly ellipsoid, 16-24 by 19–30 μ; wall colorless, rather thin, about 1.5 μ, evenly and finely verrucose, the pores obscure, 6–10, scattered.

III. Telia hypophyllous, gregarious, on small yellowish spots, roundish, small, 0.1–0.2 mm. in diameter, sometimes confluent, rather early naked, dark-brown, ruptured epidermis not conspicuous; teliospores variable in shape, ellipsoid or ovate, 18–27 by 32–45 μ, somewhat narrowed above, usually somewhat distorted in the lower cell laterally or near the pedicel owing to a protrusion of the wall at the pore, slightly or not constricted at the septum, wall chestnut-brown with a small hyaline papilla over each pore, moderately thin, 1.5–2 μ, smooth except near the pores which are often surrounded by a few hyaline beads, the pores one in a cell, apical in the upper, near the pedicel or lateral in the lower; pedicel short, deciduous.

ON ROSACEAE:
Rubus allegheniensis Porter (*R. nigrobaccus* Bailey, *R. villosus* Auct. not Ait.), Delaware, Illinois, Indiana, Iowa, Kansas, Kentucky, Maine, Maryland, Massachusetts, Missouri, New York, North Carolina, Ohio, South Dakota, Vermont, Virginia, Wisconsin.
Rubus arcticus L., Yukon.
Rubus canadensis L. (not A. Gray), Maine, Michigan, New York, West Virginia, Wisconsin.
Rubus cuneifolius Pursh, Florida.
Rubus occidentalis L., Connecticut, Illinois, Massachusetts, Nebraska, New York, North Carolina, Ohio, Vermont, West Virginia.
Rubus Randii (Bailey) Rydb., Nova Scotia.
Rubus stellatus Smith, Alaska.
Rubus strigosus Michx. (*R. idaeus canadensis* Richardson), Indiana, Massachusetts, New York, Vermont; New Brunswick, Ontario.
Rubus triflorus Richardson, (*R. americanus* Britton), New Hampshire, Wisconsin.
Rubus trivialis Michx., Florida, South Carolina, Texas.
Rubus vermontanus Blanch., Vermont.
Rubus villosus Ait. (*R. canadensis* A. Gray, not L., *R. procumbens* Muhl.), Connecticut, Delaware, District of Columbia, Indiana, New Hampshire, New Jersey, Pennsylvania, West Virginia.
Rubus vitifolius Cham. & Schlecht., California.

TYPE LOCALITY: Kamchatka, on *Rubus arcticus*.

DISTRIBUTION: Throughout the United States and Canada east of the Rocky mountains, and on the Pacific coast from northern California to southwestern Alaska and northward; also in Europe and northern Asia.

ILLUSTRATION: Beitr. Krypt. Schweiz **2²**: *f. 280.*

EXSICCATI: Kellerm. & Swingle, Kan. Fungi *31*; Kellerm. Ohio Fungi *19*, *20*, *67*; Ellis, N. Am. Fungi *277*, *278*; Ellis & Ev. Fungi Columb. *57*, *1622*; Barth. Fungi Columb. *2568*, *2937*, *3238*, *3239*, *3327*; Barth. N. Am. Ured. *106*; Rav. Fungi Am. *276*; Rav. Fungi Car. 1: *91*; Rab.-Wint. Fungi Eur. *3225a*, *b*; Roum. Fungi Gall. *874*; Shear, N. Y. Fungi *67*, *133*; Thüm. Myc. Univ. *446*; Sydow, Ured. *1389*, *1785*; Seym. & Earle, Econ. Fungi *26*, *27*, *28*.

2. **Gymnoconia Rosae-gymnocarpae** (Dietel) Arthur.

Caeoma Rosae-gymnocarpae Dietel, Hedwigia 44: 334. 1905.

O. Pycnia chiefly epiphyllous, scattered among the aecia, punctiform, orange-yellow fading to light-yellow, prominent, subcuticular, irregularly conical, 120–190 μ broad, half as high.

I. Aecia hypophyllous, from a perennial mycelium, causing hypertrophy of the shoot, crowded over the whole under surface of the leaflets, roundish or oblong, 0.5 mm. or more across, pulvinate, soon naked, orange-yellow, fading to pale-yellow, somewhat pulverulent, ruptured epidermis inconspicuous; aeciospores ovoid or ellipsoid, 18–24 by 27–40 μ; wall colorless, thick, 2.5–3.5 μ, densely and minutely verrucose with round papillae.

III. Telia unknown.

ON ROSACEAE:
Rosa gymnocarpa Nutt., California.
TYPE LOCALITY: California, on *Rosa gymnocarpa*.
DISTRIBUTION: Northern to southern California on the Pacific slope.

23. **XENODOCHUS** Schlecht. Linnaea 1: 237. 1826.

Cycle of development includes pycnia, aecia, and telia, with distinct alternating phases; autoecious. Pycnia subcuticular, other sori subepidermal.

Pycnia flattish, without ostiolar filaments.

Aecia erumpent, indefinite, without peridium or paraphyses. Aeciospores ellipsoid; wall colorless, verrucose.

Telia erumpent, somewhat indefinite. Teliospores free, cylindrical, three- to many-celled by transverse septa; wall colored, smooth, the pores 2 in a cell, opposite, in upper part near the septa, one and apical in the uppermost cell; pedicels hyaline, short.

Type species, *Xenodochus carbonarius* (on *Sanguisorba officinalis*).

1. **Xenodochus minor** Arthur, sp. nov.

O. & I. Unknown.

III. Telia amphigenous and caulicolous, rounded or elongate, 0.75–1.5 mm. across by 2–5 mm. or more long, often confluent, pulvinate, early naked, blackish-brown, ruptured epidermis conspicuous; teliospores 3–7-celled, usually 6, elongate, cylindrical, or rarely somewhat clavate, often curved, 16–21 by 40–140 μ, somewhat constricted at the septa, lower cells sometimes longer than upper ones; wall light chestnut-brown, concolorous, or paler at base, moderately thick, 1.5–2 μ, smooth, or sometimes with one or a few small hyaline papillae at apex, the pores 2, opposite, in upper part of each cell near the septum, except uppermost cell which has one apical pore; pedicel hyaline, as long as lowest cell or shorter, 6–9 μ thick, slightly narrowed downward.

ON ROSACEAE:
Sanguisorba latifolia (Hook.) Coville, Alaska.
Type collected at Karluk, Kadiak Island, Alaska, 1902, *W. T. Horne*.

24. **SPIRECHINA** Arth. Jour. Myc. **13**: 30. 1907.

Cycle of development includes pycnia, uredinia, and telia; autoecious. Pycnia subcuticular, other sori subepidermal or infra-epidermal.

Pycnia flattened-hemispherical, without ostiolar filaments.

Uredinia erumpent, definite, without peridium or paraphyses. Urediniospores borne singly on pedicels, ellipsoid; wall nearly colorless, echinulate or echinulate-verrucose, often in spiral lines, the pores obscure; contents colored.

Telia erumpent or superficial, definite, without paraphyses. Teliospores borne singly on pedicels, obovate or lanceolate-obovate, one-celled; wall nearly or quite colorless, smooth, the pore apical.

Type species, *Uredo Loeseneriana* P. Henn. (on *Rubus* sp.).

Urediniospores spirally marked; teliospore-wall thicker above.
  Urediniospores spirally beaded; teliospores not coronate. — 1. *S. Loeseneriana*.
  Urediniospores spirally winged; teliospores coronate. — 2. *S. Arthuri*.
Urediniospores not spirally marked; teliospore-wall uniformly thin.
  Urediniospores coronate; telia conspicuous. — 3. *S. Pittieriana*.
  Urediniospores not coronate.
    Urediniospores spinosely echinulate; telia inconspicuous. — 4. *S. Rubi*.
    Urediniospores minutely echinulate; telia conspicuous. — 5. *S. epiphylla*.

1. **Spirechina Loeseneriana** (P. Henn.) Arth. Jour. Myc. **13**: 30. 1907.

Uredo Loeseneriana P. Henn. Hedwigia **37**: 273. 1898.
Uromyces Usterii Speg. Rev. Mus. La Plata **15**: 7. 1908.
Uromyces Loesenerianus Sydow, Monog. Ured. **2**: 202. 1910.

O. Pyncia amphigenous and caulicolous, numerous, scattered over more or less globular galls preceding the uredinia, inconspicuous, honey-yellow becoming golden-brown,

subcuticular extending into the epidermal cells beneath, hemispherical or discoid, 140–225 μ broad by 80–100 μ high; pycniospores abundant, oval, about 3 μ long.

II. Uredinia chiefly hypophyllous, at first on firm hemispherical or spherical excrescences 3–20 mm. across, on both leaves and stems, afterward scattered without hypertrophy on under surface of the blades, pulvinate, soon naked, pulverulent, bright orange-yellow fading to pale-yellow, sometimes confluent, ruptured epidermis noticeable; urediniospores ellipsoid or obovate-oblong, 16–26 by 19–40 μ; wall pale-yellow, 1.5–2.5 μ thick, thicker above, 3–5 μ, echinulate-verrucose with rather fine tubercles closely set in spiral rows 2–3 μ apart, the pores obscure.

III. Telia chiefly hypophyllous, scattered, small, 0.1–0.2 mm. across, soon naked, pulverulent, becoming pale-yellow or whitish, ruptured epidermis not noticeable; teliospores narrowly obovate or oblong, 16–19 by 42–48 μ, usually germinating upon maturity; wall nearly or quite colorless, 1–1.5 μ thick, thicker above, 3–5 μ, smooth.

ON ROSACEAE:
Rubus sp., Guatemala.
TYPE LOCALITY: Jalambohoch, Guatemala, on *Rubus* sp.
DISTRIBUTION: Central America; also in South America.

2. **Spirechina Arthuri** (Sydow) Arthur.

Uromyces Arthuri Sydow, Monog. Ured. 2: 203. 1910.

O. Pycnia not seen.

II. Uredinia not seen; urediniospores few, remaining in the telia, ellipsoid, 16–19 by 26–30 μ; wall pale-yellow, thin, 1–1.5 μ, marked with finely serrate winged appendages about 1–1.5 μ high, set about 2–3 μ apart and running spirally around the spore, the pores obscure.

III. Telia hypophyllous, scattered, small, roundish, 0.1–0.3 mm. across, soon naked, becoming pale-yellow or whitish, pulverulent, ruptured epidermis not noticeable; teliospores oblong, spatulate or sometimes triangular, 18–25 by 33–40 μ, coronate at apex, usually narrowed below; wall nearly or quite colorless, thin, 1 μ, thicker at apex which is set with two to several large roundish projections, each 4–7 μ wide by 4–9 μ long, smooth; pedicel short, deciduous.

ON ROSACEAE:
Rubus Schiedeanus Steud., Guatemala.
TYPE LOCALITY: Coban, Department of Alta Verapaz, Guatemala, on *Rubus Schiedeanus*.
DISTRIBUTION: Known only from the type locality.

3. **Spirechina Pittieriana** (P. Henn.) Arthur.

Uromyces Pittierianus P. Henn. Hedwigia Beibl. 41: 101. 1902.
Uredo ochraceo-flava P. Henn. Hedwigia Beibl. 41: 101. 1902.

O. Pycnia epiphyllous, few in crowded groups, soon surrounded by primary uredinia, prominent, honey-yellow becoming golden-brown, subcuticular extending into the epidermal cells beneath, mammilloid, about 145 μ broad by 80 μ high.

III. Uredinia at first (primary) epiphyllous, few surrounding the pycnia, not crowded, groups 1–3 mm. across, sori irregularly roundish, 0.1–0.3 mm. across, at first bullate, ruptured irregularly, pulverulent, dirty-white when old, rupturing epidermis overarching and moderately conspicuous; urediniospores ellipsoid or obovoid, 18–21 by 29–43 μ; wall nearly colorless, rather thick, 3–4 μ, slightly thicker above, spinosely and sparsely echinulate, more pronounced at apex with spines arranged in a crown sometimes more pronounced at base forming a tuft directed downward, the pores obscure; secondary form not well shown, probably hypophyllous with small sori.

III. Telia hypophyllous, scattered, often more numerous along the edges of the leaf, small, 0.3–0.8 mm., early naked, pulverulent, white, ruptured epidermis inconspicuous; teliospores fusiform or irregularly cylindroid, 15–21 by 40–75 μ, usually narrowed toward both ends; wall colorless, uniformly thin, 1 μ or less, smooth; pedicel colorless, half length of spore or less, 6–8 μ in diameter.

ON ROSACEAE:
Rubus adenotrichos Schlecht., Costa Rica.
TYPE LOCALITY: Hacienda Belmira near Santa Maria de Dota, Costa Rica, on "*Rubus* sp.," determined by W. O. Focke to be *R. adenotrichos*.
DISTRIBUTION: Known only from the type locality.

4. **Spirechina Rubi** (Dietel & Holway) Arthur.

Uromyces Rubi Dietel & Holway; Holway, Bot. Gaz. 31: 327. 1901.

O. Pycnia epiphyllous, few in small groups, 0.3–0.5 mm. across, on larger discolored spots which are 0.8–2 mm. across, pustular, prominent, flattened-hemispheric, 75–120 μ broad and less than half as high.

II. Uredinia at first epiphyllous, usually surrounding the pycnia, groups 0.5–2 mm. across, sori irregular in outline, 0.1–0.3 mm. across in shortest diameter, usually somewhat elongate and often confluent into one or more rings, at first bullate, soon naked and applanate, pulverulent, orange-colored fading to whitish, ruptured epidermis overarching and conspicuous; urediniospores obovate or ellipsoid, 17–21 by 23–32 μ; wall pale-yellowish, or nearly colorless, moderately thick, 1.5–2 μ, sometimes thicker above, 2–5 μ, strongly spinosely-echinulate, the points about 3 μ apart, often much longer and more prominent on apical part, the pores very indistinct, seemingly 3 or 4 and equatorial; secondary form not well shown, probably hypophyllous, and the spores thinner-walled and less strongly echinulate.

III. Telia hypophyllous, minute, arising from the stomata, in indefinite groups, 0.8–1.5 mm. across on larger yellow areas, seemingly pulverulent, white; teliospores irregularly ovoid or ellipsoid, 15–25 by 24–32 μ, often somewhat pointed above and narrowed below; wall colorless, uniformly thin, 1 μ or less, smooth.

ON ROSACEAE:
Rubus adenotrichos Schlecht., Veracruz.
Rubus glaucus Benth., Guatemala.
Rubus poliophyllus Focke, Guatemala.
Rubus sp., Michoacan, Morelos.
TYPE LOCALITY: Cuernavaca, Mexico, on *Rubus* sp.
DISTRIBUTION: Central Mexico southward into Central America.

5. **Spirechina epiphylla** Arthur, sp. nov.

O. Pycnia unknown.

II. Uredinia hypophyllous, small and inconspicuous, only a few seen; urediniospores ellipsoid or broadly obovate, 18–20 by 20–24 μ; wall nearly or quite colorless, thin, 1–1.5 μ, finely and closely echinulate, the pores 3 or 4, approximately equatorial.

III. Telia epiphyllous, numerous in circinnating groups 2–4 mm. across, aecioid, roundish or irregular, small but distinct, about 0.1 mm. across, rarely confluent, soon naked, white or whitish, velvety, ruptured epidermis inconspicuous; teliospores originating within the enlarged epidermal cells, irregularly fusiform, 12–19 by 34–45 μ, narrowed at both ends; wall colorless, uniformly thin, 1 μ, smooth; pedicel short, one half length of spore or less, more or less deciduous, colorless, terete.

ON ROSACEAE:
Rubus trivialis Michx., Texas.
Type collected at College Station, Texas, on *Rubus trivialis*, May 22, 1890, *H. S. Jennings*.
DISTRIBUTION: Known only from the type locality.

25. **KUEHNEOLA** Magn. Bot. Centr. **74**: 169. 1898.

Cycle of development includes pycnia, uredinia, and telia; autoecious. Pycnia subcuticular, other sori subepidermal.

Pycnia flattened, hemispherical, without ostiolar filaments.

Uredinia erumpent, definite, with no paraphyses in the primary form, but usually with paraphyses in the secondary form. Urediniospores borne singly on pedicels; wall usually pale or quite colorless, echinulate or verrucose-echinulate, the pores obscure, usually 2 or 3, equatorial.

Telia erumpent, definite, without paraphyses. Teliospores free, three- to several-celled by transverse septa; wall colored or sometimes nearly colorless, smooth or somewhat roughened at apex, the pores one in each cell, apical.

Type species, *Phragmidium albidum* Ludw. (on *Rubus* sp.).

Teliospores few- (3–5-) celled, pedicellate.
Secondary uredinia usually without paraphyses. 1. *K. obtusa*.
Secondary uredinia usually with paraphyses. 2. *K. Duchesneae*.

Teliospores many- (5–13-) celled, apedicellate.
  Cells adhering in free chains.
    Secondary uredinia without paraphyses. 3. *K. Uredinis.*
    Secondary uredinia with paraphyses. 4. *K. malvicola.*
  Cells readily falling apart, chains adpressed. 5. *K. Gossypii.*

1. **Kuehneola obtusa** (Strauss) Arthur.

Uredo obtusa Strauss, Ann. Wett. Ges. 2 : 107. 1810.
Aregma obtusata Fries, Obs. Myc. 1 : 225, in part. 1815.
Puccinia Potentillae Schw. Trans. Am. Phil. Soc. II. 4 : 297. 1832.
Phragmidium Tormentillae Fuckel, Symb. Myc. 46. 1869.
Aregma triarticulatum Berk. & Curt.; Berk. Grevillea 3 : 51. 1874.
Phragmidium triarticulatum Farl. Bull. Bussey Inst. 1 : 433. 1876.
Phragmidium obtusum Wint. in Rab. Krypt. Fl. 1[1] : 229. 1881. Not *P. obtusum* Schmidt & Kunze, 1816.
Phragmidium Potentillae-canadensis Dietel, Hedwigia Beibl. 42 : 179. 1903.
Kuehneola Potentillae Arth. Résult. Sci. Congr. Bot. Vienne 342. 1906.
Kuehneola Tormentillae Arth. Résult. Sci. Congr. Bot. Vienne 342. 1906.

O. Pycnia epiphyllous, in small crowded groups 0.1–0.4 mm. across, on slightly larger reddened and somewhat hypertrophied spots, inconspicuous, in section globoid-lenticular, 112–160 μ broad by 35–50 μ high.

II. Uredinia at first epiphyllous, surrounding the pycnia, in crowded groups 0.5–1.3 mm. across, roundish or irregular, often confluent into rings, at first bullate, soon naked, somewhat waxy; uredinia afterward hypophyllous, scattered irregularly, round, 0.2–0.5 mm. across, early naked, slightly pulvinate, pulverulent, orange-yellow, fading to dirty-white, ruptured epidermis noticeable; paraphyses usually wanting; urediniospores obovate or ellipsoid, 15–18 by 19–26 μ; wall pale-yellow, nearly colorless, thin, 1–1.5 μ, finely verrucose-echinulate, points 1–2 μ apart, the pores small, inconspicuous, 3 or 4, equatorial.

III. Telia hypophyllous, scattered, round, 0.2–0.5 mm. across, early naked, pulvinate, velvety, cinnamon-brown, ruptured epidermis inconspicuous; teliospores cylindrical-clavate, or clavate-lanceolate, 20–27 by 48–90 μ, rounded or obtuse above, obtuse or narrowed below, slightly or not constricted at the septa, 3–5-celled; wall cinnamon-brown, paler below, thin, 1–2 μ, thicker at apex, 5–8 μ, smooth; pedicel colorless, or tinted next to the spore, terete, 7–10 μ in diameter, firm, with thick wall, one half to once length of spore.

ON ROSACEAE :
Potentilla canadensis L., Connecticut, Illinois, Indiana, Iowa, Kansas, Kentucky, Maine, Massachusetts, Michigan, Missouri, New York, North Carolina, Ohio, Pennsylvania, Rhode Island, South Carolina, Virginia, West Virginia, Wisconsin; Nova Scotia, Ontario.

TYPE LOCALITY: Europe, on *Tormentilla erecta.*
DISTRIBUTION: South Carolina to Kansas and northward into Canada; also in Europe.
ILLUSTRATION: Beitr. Krypt. Schweiz 2[2]: *f. 288.*
EXSICCATI: Ellis, N. Am. Fungi *283, 284;* Barth. Fungi Columb. *2543, 3240;* Barth. N. Am. Ured. *109;* Thüm. Myc. Univ. *1445, 1735;* Vesterg. Micr. Rar. Sel. *634;* Kellerm. Ohio Fungi *87;* Roum. Fungi Sel. *5017.*

2. **Kuehneola Duchesneae** Arthur, sp. nov.

O. Pycnia chiefly epiphyllous, in small crowded groups, often confluent, inconspicuous, indefinitely mammilloid, often extending between and obliterating the epidermal cells, 90–130 μ broad by 50–55 μ high.

II. Uredinia at first (primary) amphigenous and surrounding the pycnia, soon (secondary) quite hypophyllous and scattered, round, 0.3–0.8 mm. across, early naked, slightly pulvinate, pulverulent, yellow becoming pale, ruptured epidermis noticeable; paraphyses with secondary uredinia few, peripheral, not reaching above the spore-mass, cylindrical, nearly or quite erect, 8–12 by 40–50 μ, the wall uniformly thin, 1 μ or less, colorless, smooth; urediniospores broadly ellipsoid or globoid, 14–17 by 16–23 μ; wall nearly or quite colorless, thin, 1 μ or less, minutely and closely echinulate, points 1–1.5 μ apart, the pores small, inconspicuous, 3, equatorial.

III. Telia hypophyllous, scattered, round, 0.2–0.5 mm. across, early naked, pulvinate, velvety, cinnamon-brown, ruptured epidermis inconspicuous; teliospores cylindrical-clavate or clavate-lanceolate, 19–26 by 50–80 μ, rounded or obtuse above, obtuse or narrowed below, slightly or not constricted at septa, 3–5-celled; wall cinnamon-brown, paler below,

thin, 1.5–2 μ, thicker at apex, 5–10 μ, smooth; pedicel colorless, or tinted next the spore, terete, 7–10 μ in diameter, firm, one half to once length of spore.

ON ROSACEAE:
Duchesnea indica (Andr.) Focke (*Fragaria indica* Andr.), Alabama, Delaware, Florida, Georgia, Louisiana, Mississippi, North Carolina, South Carolina.
Type collected at West Raleigh, North Carolina, on *Fragaria indica*, May 19, 1909, *B. B. Higgins*.
DISTRIBUTION: The coastal states from Delaware to Louisiana.
EXSICCATI: Rav. Fungi Am. *732*; Barth. Fungi Columb. *3050*.

3. Kuehneola Uredinis (Link) Arthur.

Oidium Uredinis Link, in Willd. Sp. Pl. 6[1]: 123. 1824.
Torula Uredinis Fries, Syst. Myc. 3: 503. 1832.
Oospora Uredinis Wallr. Fl. Crypt. Germ. 2: 183. 1833.
Trichobasis vepris hypophylla Otth; Wartm. & Schenk, Schweiz. Krypt. *607*. 1869.
Trichobasis vepris epiphylla Otth; Wartm. & Schenk, Schweiz. Krypt. *608*. 1869.
Chrysomyxa albida Kühn, Bot. Centr. 16: 154. 1883.
Uredo aecidioides Jul. Müll. Ber. Deuts. Bot. Ges. 3: 393. 1885. Not *U. aecidioides* Peck, 1872.
Uredo Muelleri Schröt. Krypt. Fl. Schles. 3[1]: 375. 1887.
Phragmidium albidum Lagerh. Mitth. Bad. Bot. Ver. 1888: 44. 1888.
Coleosporium Rubi Ellis & Holway; Sacc. Syll. Fung. 7: 759. 1888.
Kuehneola albida Magn. Bot. Centr. 74: 169. 1898.

O. Pycnia epiphyllous, in small crowded groups 0.3–0.5 mm. across, on somewhat larger reddened spots, pustular, prominent, flattened-hemispherical, or irregularly lenticular, large, 150–200 μ in diameter, nearly half as high.

II. Uredinia at first epiphyllous, surrounding the pycnia, in crowded groups 0.5–1.3 mm. across, irregular in outline, 0.1–0.3 mm. across in shortest diameter, usually somewhat elongate and often confluent into rings, at first bullate, soon naked and applanate, pulverulent, orange-colored fading to whitish, ruptured epidermis noticeable; uredinia afterward hypophyllous, scattered irregularly, round, small, about 0.1 mm. across, early naked, pulverulent, pale lemon-yellow becoming nearly colorless, ruptured epidermis inconspicuous; paraphyses wanting; urediniospores of primary form irregularly ellipsoid, or elliptical-obovate, 16–20 by 20–27 μ, of secondary form more regularly obovate, or globose-obovate, and slightly smaller, 15–19 by 17–25 μ; wall nearly or quite colorless, moderately thin, about 1.5 μ, noticeably and rather closely verrucose-echinulate, points about 1 μ apart, lower and broader in the primary than in the secondary form, the pores small, very indistinct, probably 3 or 4 and equatorial.

III. Telia hypophyllous, irregularly scattered, irregularly roundish, 0.1–0.5 mm. across, early naked, pulvinate, velvety, yellowish or pure white, ruptured epidermis inconspicuous; teliospores cylindrical or cylindrical-clavate, 18–24 by 85–110 μ, irregularly flattened or coronate above, narrowed below, 5–13-celled, usually 5–6-celled, each cell 15–24 by 17–40 μ, mostly 20 by 25 μ, trapezoidal, and articulated to the cell above by a projection at one side containing the pore; wall nearly or quite colorless, thin, 1.5–2 μ, the apical cell thicker above, 3–5 μ, the other cells thickened above uniformly or only at the lateral projections, smooth, or slightly roughened at apex; pedicel colorless, terete, very short, often seemingly wanting.

ON ROSACEAE:
Rubus abbrevians Blanch., Vermont.
Rubus alleghenıensis Porter (*R. nigrobaccus* Bailey, *R. villosus* Auct. not Ait.), Arkansas, Delaware, District of Columbia, Illinois, Indiana, Iowa, Maine, Massachusetts, Mississippi, New York, North Carolina, Ohio, West Virginia.
Rubus Andrewsianus Blanch., Virginia.
Rubus canadensis L. (not A. Gray), Maine, West Virginia, Wisconsin.
Rubus cuneifolius Pursh, Alabama, Florida.
Rubus floridus Tratt., Alabama, Louisiana.
Rubus hispidus L., Connecticut, Maine, Massachusetts, New Hampshire, New York, North Carolina, West Virginia.
Rubus Jeckylanus Blanch., Maine.
Rubus Millspaughii Britton, North Carolina.
Rubus multiformis Blanch., Maine.
Rubus pergratus Blanch., Maine.
Rubus Roesbergianus Blanch., Connecticut.
Rubus rubrisetus Rydb., Louisiana.
Rubus trivialis Michx., Louisiana, Mississippi.

Rubus villosus Ait. (*R. canadensis* A. Gray, not L.; *R. procumbens* Muhl.), Massachusetts.
Rubus vitifolius Cham. & Schlecht., California.

TYPE LOCALITY: Berlin, Germany, on *Rubus fruticosus*.

DISTRIBUTION: Eastern United States from Louisiana, Arkansas and Iowa to Florida and Maine, and sparingly along the Pacific coast in California; also in Europe.

EXSICCATI: Ellis & Ev. N. Am. Fungi *1878*; Seym. & Earle, Econ. Fungi *30a*, *30b*, *31*, *470*; Barth. Fungi Columb. *2840*; Kellerm. Ohio Fungi *186*.

ILLUSTRATIONS: Jul. Müll. Rostpilze (Inaug.-Diss.) *f. 9*, *12*, *13*.

4. **Kuehneola malvicola** (Speg.) Arthur.

Uredo malvicola Speg. Anal. Soc. Ci. Argent. **17**: 124. 1884.
Uredo Hibisci Sydow, Hedwigia Beibl. **40**: 128. 1901.

O. Pycnia not seen.

II. Uredinia hypophyllous, numerous, scattered over entire leaf, often crowded, irregularly orbicular, bullate, 0.2–1 mm. across, size varying on different hosts, tardily naked, pulverulent, cinnamon-brown, ruptured epidermis usually conspicuous and often overarching; paraphyses few, peripheral, not reaching above the spore-mass, cylindrical, often slightly incurved, 9–13 by 45–60 μ, the wall uniformly thin, 1 μ or less, colorless, smooth; urediniospores ellipsoid or broadly obovate, 15–19 by 19–26 μ; wall light golden-yellow, 1–1.5 μ, finely and closely echinulate, the pores indistinct, 2, opposite, equatorial or slightly above.

III. Telia hypophyllous, few, scattered, punctiform or orbicular, 0.1–0.3 mm. across, becoming prominent and apparently much larger by the long spreading spores, early naked, pulvinate, dark cinnamon-brown becoming whitish by germination, ruptured epidermis inconspicuous; teliospores terete, 15–19 by 77–150 μ, rounded above, tapering below, slightly constricted at septa, 4–12- (usually 8–10-) celled; wall light cinnamon-brown, thin, 1 μ or less, not or only slightly thickened at apex, smooth; pedicel indistinguishable.

ON MALVACEAE:
Hibiscus Syriacus L., Louisiana; Cuba.
Malvaviscus arboreus Cav., Guatemala.
Malvaviscus Drummondii T. & G., Texas.

TYPE LOCALITY: Cerro Hu, near Paraguari, Paraguay, on "*Abutilon* sp."

DISTRIBUTION: Southern United States bordering the Gulf of Mexico, southward in the West Indies and Central America; also in South America.

EXSICCATI: Ellis & Ev. N. Am. Fungi *2408*.

5. **Kuehneola Gossypii** (Lagerh.) Arthur.

Uredo Gossypii Lagerh. Jour. Myc. 7: 48. 1891.

O. Pycnia not seen.

II. Uredinia at first (primary) epiphyllous, rather deep-seated in the tissues, soon (secondary) hypophyllous, more shallow, scattered over the leaf, or somewhat grouped on purplish spots 1–5 mm. across, bullate, roundish, 0.1–0.5 mm. across, tardily naked, slightly pulverulent, brownish-yellow, ruptured epidermis overarching and conspicuous; paraphyses with secondary uredinia numerous, peripheral, appearing somewhat higher than the spore-mass, more or less clavate, usually incurved, 7–15 by 45–65 μ, the wall uniformly thin, 1 μ or less, colorless, smooth; urediniospores ellipsoid or broadly obovate, 16–19 by 19–27 μ; wall pale-yellow or nearly colorless, thin, 1–1.5 μ, rather closely and noticeably echinulate, points 1–1.5 μ apart, the pores inconspicuous, probably 2, equatorial.

III. Telia rare, hypophyllous, deep-seated in the tissues, scattered, not readily distinguished from uredinia, tardily naked, somewhat pulverulent, light cinnamon-brown, ruptured epidermis somewhat overarching and noticeable; teliospores in adhering chains, cylindrical, 10–13 by 80–110 μ, 5–8- (usually 7-) celled, the cells angularly and irregularly oblong, 24–32 μ long, separating readily at surface of sorus; wall pale golden-brown, moderately thin, about 1.5 μ, thicker above, 3–6 μ, smooth; pedicel indistinguishable.

ON MALVACEAE:
Gossypium acuminatum Roxb., Florida; Cuba.
Gossypium arboreum L., Florida.
Gossypium hirsutum L., Florida; Porto Rico.
Gossypium mexicanum Tod., Florida.
Gossypium microcarpum Tod., Florida.
Gossypium peruvianum Cav., Florida.

TYPE LOCALITY: Balsapamba, Ecuador, on *Gossypium* sp.

DISTRIBUTION: Southern Florida and West Indies; also in South America and India.

EXSICCATI: Barth. Fungi Columb. *2489*.

26. GYMNOSPORANGIUM * Hedw. f.; DC. Fl. Fr. 2: 216. 1805.

Aecidium Pers. in J. F. Gmel. Syst. Nat. 2: 1472. 1791.
Roestelia Reb. Prodr. Fl. Neom. 350. 1804.
Podisoma Link, Ges. Nat. Freunde Berlin Mag. 3: 9. 1809.
Aecidium § *Cancellaria* Brongn. Dict. Sci. Nat. 33: 521. 1824.
Centridium Chev. Fl. Env. Paris 1: 383. 1826.
Cyglide Chev. Fl. Env. Paris 1: 384. 1826.
Hamaspora Körn. Hedwigia 16: 22. 1877.
Puccinia Kuntze, Rev. Gen. 3³: 507. 1898. Not *Puccinia* Willd. 1787, nor Pers. 1794.

Aecidium is the oldest generic name, and was used in the key on page 129, but as it and *Roestelia* have come into general use for form-genera, and their restriction to a true generic application might sometimes lead to confusion, a later name and one more commonly used is here maintained.

Cycle of development includes pycnia, aecia, and telia, with distinct alternating phases; heteroecious and autoecious. Pycnia and other sori subepidermal.

Pycnia deep-seated, usually globoid, generally prominent and conspicuous, at first honey-yellow, usually becoming blackish, with ostiolar filaments.

Aecia erumpent, at first cylindrical. Peridium dingy-white, in a few species short and cupulate but usually elongated into a more or less tubular form, membranous, tending to rupture by longitudinal slits along the sides; peridial cells imbricate and often articulate, occasionally hygroscopic, becoming curved when wet, the outer walls smooth (except in a few species), rather thin (except in *G. hyalinum*), the inner and side walls smooth, verrucose with warty or tubercle-like elevations, rugose with ridges or ridge-like papillae beginning on the inner wall, directed downward and outward and extending obliquely on to the side walls, or spinulose with diminutive spines or spicules, usually rather thick. Aeciospores globoid to broadly ellipsoid; wall colored, verrucose, usually with numerous, scattered evident germ-pores.

Telia erumpent, naked, usually definite, variously shaped, gelatinous and elastic at maturity, expanding considerably when moistened. Teliospores chiefly 2-celled, in some species 3-, 4-, or 5-celled, by transverse septa; walls colored, of varying thickness, smooth, the pores usually 2 in each cell, sometimes 1, 3, or 4, variously arranged, often near the septa, sometimes apical in the upper, rarely near the pedicel in the lower (numerous and scattered in *G. multiporum*); pedicels hyaline, elastic, usually of considerable length, cylindrical (carotiform in *G. inconspicuum* and *G. germinale*), the walls thick, the outer portions swelling and becoming gelatinized in moisture to form a jelly-like matrix in which the spores appear imbedded.

Type species, *Gymnosporangium conicum* Hedw. f. (on *Juniperus* sp.).

Aecia present and exclusively considered.

Heteroecious; aecia inhabiting family Malaceae (except Nos. 17 and 19).
- Aecia short, cupulate; peridium lacerate or erose.
  - Aeciospores small (12–23 μ), the wall thin (1–1.5 μ). — 1. *G. Blasdaleanum*.
  - Aeciospores large (23–29 μ), the wall thick (3–4 μ). — 2. *G. Sorbi*.
- Aecia elongate, tubular at first, in some species becoming altered by dehiscence.
  - Peridium retaining tubular or cornute form, unaltered by dehiscence.
    - Peridium finally dehiscent at apex, slightly or not at all lacerate.
      - Peridial cells verrucose.
        - Peridial cells very thick in side view (45–65 μ).
          - Side walls of peridial cells verrucose only on inner third. — 4. *G. inconspicuum*.
          - Side walls of peridial cells verrucose over entire surface. — 5. *G. Harknessianum*.
        - Peridial cells moderately thick in side view (16–39 μ).
          - Aeciospore-wall chestnut-brown. — 28. *G. Nelsoni*.
          - Aeciospore-wall pale-yellow. — 19. *G. gracilens*.
      - Peridial cells spinulose. — 7. *G. exiguum*.
      - Peridial cells rugose.
        - Inner and side walls of peridial cells moderately rugose; aeciospore-walls dark cinnamon-brown. — 8. *G. Davisii*.
        - Inner and side walls of peridial cells coarsely rugose; aeciospore-walls light chestnut-brown. — 16. *G. cornutum*.

*By FRANK DUNN KERN.

Peridium dehiscent with longitudinal slits along the sides.
Peridial cells subspinulose. 11. *G. trachysorum.*
Peridial cells verrucose. 29. *G. corniculans.*
Peridial cells verrucose-rugose. 9. *G. juvenescens.*
Peridial cells rugose. 12. *G. tubulatum.*
Peridial cells smooth. 13. *G. Botryapites.*
Peridium losing tubular form by becoming lacerate or fimbriate.
Peridium spreading or more or less erect after dehiscence.
Peridial cells rough.
Peridial cells lanceolate in face view (not often seen in side view).
Aeciospore-wall cinnamon-brown, very thick (3–4 μ). 14. *G. Nidus-avis.*
Aeciospore-wall pale cinnamon-brown, moderately thick (2–2.5 μ). 17. *G. exterum.*
Peridial cells rhomboidal in side view (not often seen in face view).
Peridial cells verrucose; aeciospores large (21–39 μ), the wall yellowish. 15. *G. germinale.*
Peridial cells rugose.
Aeciospores small (18–23 μ), the wall cinnamon-brown. 21. *G. japonicum.*
Aeciospores very large (28–45 μ), the wall chestnut-brown. 18. *G. juniperinum.*
Peridial cells linear-rhomboidal or linear in side view.
Peridial cells verrucose.
Aeciospores small (18–22 μ), the wall rather thick (1.5–2.5 μ). 22. *G. transformans.*
Aeciospores rather large (21–30 μ), the wall thick (2.5–3.5 μ). 23. *G. clavariaeforme.*
Peridial cells rugose.
Aeciospores moderately large (18–30 μ), the wall rather thick (2.5–3 μ). 25. *G. Betheli.*
Aeciospores medium-sized (15–25 μ), the wall rather thin (1.5–2 μ). 26. *G. globosum.*
Peridial cells smooth. 27. *G. hyalinum.*
Peridium strongly revolute after dehiscence.
Peridial cells somewhat curved when wet; side walls closely rugose nearly to outer side. 30. *G. floriforme.*
Peridial cells strongly curved when wet; side walls rather sparsely rugose on inner half. 31. *G. Juniperi-virginianae.*
Autoecious; aecia inhabiting family Juniperaceae, and appearing on galls like the telia; peridium soon lacerate, peridial cells rugose. 32. *G. bermudianum.*

Telia present and exclusively considered.

Telia appearing on the leaves or leafy twigs, not causing material hypertrophy or distortion.
Telia pulvinate, low.
Teliospores 2–5-celled; pedicels terete. 1. *G. Blasdaleanum.*
Teliospores 2-celled.
Pedicels of teliospores terete. 3. *G. fraternum.*
Pedicels of teliospores carotiform. 4. *G. inconspicuum.*
Telia musciform, light chestnut-brown. 6. *G. multiporum.*
Telia tongue-shaped, chestnut-brown. 7. *G. exiguum.*
Telia hemispherical, chocolate-brown.
Teliospores with large hyaline papillae over the germ-pores. 8. *G. Davisii.*
Teliospores with small hyaline papillae over the germ-pores. 16. *G. cornutum.*
Telia causing fasciation of the branches, or witches' brooms.
Telia appearing only on the leafy twigs.
Teliospores small (39–52 μ long). 9. *G. juvenescens.*
Teliospores large (55–74 μ long). 10. *G. Kernianum.*
Telia appearing only on the woody twigs and branches.
Telia hemispherical; spores 2-celled. 14. *G. Nidus-avis.*
Telia terete; spores 2–5-celled. 24. *G. Ellisii.*
Telia appearing on twigs or branches, causing more or less hypertrophy.
Enlargements abruptly fusiform, short, telia wedge-shaped. 11. *G. trachysorum.*
Enlargements gradually fusiform, long.
Telia hemispherical.
Teliospores 2–4-celled; pedicels terete. 13. *G. Botryapites.*
Teliospores 2-celled.
Pedicels of teliospores terete. 14. *G. Nidus-avis.*
Pedicels of teliospores carotiform. 15. *G. germinale.*
Telia applanate or pulvinate, usually large and somewhat indefinite.
Teliospores with hyaline papillae over the germ-pores. 16. *G. cornutum.*
Teliospores without hyaline papillae over the germ-pores.
Teliospores rather small (32–42 μ long). 17. *G. exterum.*
Teliospores rather large (42–61 μ long). 18. *G. juniperinum.*

Telia cristiform, orange-yellow. 19. *G. gracilens.*
Telia wedge-shaped, often irregular and lacunose.
  Teliospores moderately small (42–55 μ). 20. *G. effusum.*
  Teliospores rather large (57–66 μ). 21. *G. japonicum.*
Telia terete.
  Telia stout; teliospores 2-celled. 23. *G. clavariaeforme.*
  Telia slender; teliospores 2–5-celled. 24. *G. Ellisii.*
Telia appearing on galls or gall-like excrescences.
  Galls very irregular, usually elongate and knot-like, often in succession along a branch. 25. *G. Betheli.*
  Galls globoid or reniform.
Telia laterally compressed.
  Telia thick, wedge-shaped, chestnut-brown. 26. *G. globosum.*
  Telia thin, irregularly flattened, light chestnut-brown. 28. *G. Nelsoni.*
Telia terete.
  Telia somewhat conical, chestnut-brown.
    Teliospore-wall with slight hyaline thickenings over the germ-pores. 29. *G. corniculans.*
    Teliospore-wall uniform, without hyaline thickenings. 30. *G. floriforme.*
  Telia cylindrical or cylindrical-acuminate, golden-brown. 31. *G. Juniperi-virginianae.*
Telia pulvinate, low, inconspicuous. 32. *G. bermudianum.*

1. **Gymnosporangium Blasdaleanum** (Dietel & Holway) Kern, Bull. N. Y. Bot. Gard. **7**: 437. 1911.

Aecidium Blasdaleanum Dietel & Holway, Erythea **3**: 77. 1895.
Phragmidium Libocedri P. Henn. Hedwigia **37**: 271. 1898.
?*Aecidium Pourthiaeae* Sydow, Mém. Herb. Boiss. **4**: 3. 1900.
Gymnosporangium aurantiacum Sydow, Ann. Myc. **2**: 28. 1904.
Gymnosporangium Libocedri Kern, Bull. Torrey Club **35**: 509. 1908.

O. Pycnia chiefly hypophyllous, gregarious, usually few in small groups 0.5–1.5 mm. across, punctiform, not conspicuous, honey-yellow, conical or flask-shaped, 100–130 μ in diameter by 80–120 μ high; ostiolar filaments 75–100 μ long.

I. Aecia hypophyllous and fructicolous, in crowded groups 1–5 mm. across, cupulate, low, 0.2–0.3 mm. in diameter; peridium delicate, margin lacerate, spreading or somewhat recurved; peridial cells rhomboidal in side view, 18–23 μ long, the outer wall 3–4 μ thick, transversely striate, smooth, the inner and side walls about half as thick, verrucose; aeciospores globoid, 12–20 by 14–23 μ; wall pale-yellow, rather thin, 1–1.5 μ, finely verrucose.

ON MALACEAE:
Amelanchier alnifolia Nutt., California, Oregon.
Amelanchier florida Lindl., Oregon.
Amelanchier pallida Greene, California.
Crataegus Douglasii Lindl. (*C. brevispina* Dougl.), California, Oregon.
Crataegus rivularis Nutt., California.

III. Telia foliicolous, from an annual mycelium, not causing noticeable distortions, scattered, roundish-oval, about 0.8–1.5 mm. across, pulvinate, reddish-brown, ruptured epidermis not noticeable; teliospores 2–5-celled, linear-oblong, 19–30 by 35–87 μ, slightly constricted at the septa; wall pale-brown, thin, 1 μ, the pores 1 in the upper cell, 2 in the other cells, apical; pedicels cylindrical, often large, 7–25 μ in diameter.

ON JUNIPERACEAE:
Heyderia decurrens (Torr.) K. Koch (*Libocedrus decurrens* Torr.), California, Oregon.
TYPE LOCALITY: Shasta Springs, Siskiyou County, California, on *Crataegus rivularis*.
DISTRIBUTION: Pacific slope from northern California northward into Oregon; possibly also in Japan.
ILLUSTRATIONS: Bull. N. Y. Bot. Gard. 7: 438, *f. 2; pl. 154, f. 44.*
EXSICCATI: Sydow, Ured. *1149, 1786;* Ellis & Ev. N. Am. Fungi *3248.*

2. **Gymnosporangium Sorbi** (Arth.) Kern, Bull. N. Y. Bot. Gard. **7**: 438. 1911.

Aecidium Sorbi Arth. Bull. Torrey Club **33**: 521. 1906.

O. Pycnia epiphyllous, numerous, gregarious, in small groups on discolored areas, noticeable, subepidermal, honey-yellow becoming brownish, conoidal, 110–130 μ in diameter, 70–80 μ high; ostiolar filaments 30–45 μ long.

I. Aecia hypophyllous, numerous, gregarious, in small groups of 4 to 7, arising from slight swellings on discolored spots, or often more numerous on larger swellings on the veins or rachis, cupulate, 0.2–0.4 mm. high by 0.2–0.3 mm. in diameter; peridium color-

less, margin nearly erect, erose; peridial cells rhomboidal, 30–45 μ long, slightly overlapping, the lumen small, the outer wall much thickened, 10–13 μ, transversely striate, smooth, the inner and side walls thinner, 3–5 μ, somewhat striate, moderately verrucose; aeciospores broadly ellipsoid, usually somewhat angular, 23–27 by 27–39 μ; wall pale-yellow, thick, 3–4 μ, minutely verrucose.

ON MALACEAE:
Malus rivularis (Doug.) Roem., British Columbia.
Sorbus occidentalis (S. Wats.) Greene, Washington; British Columbia.
Sorbus scopulina Greene, Alaska.

III. Telia unknown.

TYPE LOCALITY: Hodag Lake, Vancouver Island, British Columbia, on *Sorbus occidentalis*.
DISTRIBUTION: Along the Pacific coast from Washington northward to southeastern Alaska.
ILLUSTRATIONS: Bull. N. Y. Bot Gard. 7: 438, *f. 3; pl. 152, f. 38*.

3. **Gymnosporangium fraternum** Kern, Bull. N. Y. Bot. Gard. 7: 439. 1911.

O and I. Pycnia and aecia unknown.

III. Telia foliicolous, from an annual mycelium, solitary, scattered, oval, 0.8–2 mm. across, pulvinate, chestnut-brown, ruptured epidermis usually noticeable; teliospores 2-celled, ellipsoid, 16–19 by 39–48 μ, rounded above, narrowed below, slightly constricted at the septum; wall cinnamon-brown, moderately thin, 1.5–2.5 μ, thicker above, 3–5 μ, the pores 2 in each cell, near the septum; pedicels cylindrical, uniform, 5–6 μ in diameter.

ON JUNIPERACEAE:
Chamaecyparis thyoides (L.) B.S.P. (*C. sphaeroidea* Spach, *Cupressus thyoides* L.), Massachusetts, New Jersey.
TYPE LOCALITY: Newfield, New Jersey, on *Chamaecyparis thyoides*.
DISTRIBUTION: Small area along the Atlantic coast from Massachusetts to New Jersey.
ILLUSTRATION: Bull. N. Y. Bot. Gard. 7: 439, *f. 4*.
EXSICCATI: Seym. & Earle, Econ. Fungi *244*; Ellis, N. Am. Fungi *1479*; Roum. Fungi Sel. *4886*.

4. **Gymnosporangium inconspicuum** Kern, Bull. Torrey Club 34: 461. 1907.

Roestelia Harknessianoides Kern, Bull. Torrey Club 34: 463. 1907.

O. Pycnia chiefly fructicolous, numerous, scattered or often more or less crowded over considerable areas, punctiform, honey-yellow becoming blackish, globoid, large, 160–220 μ in diameter by 150–210 μ high; ostiolar filaments 65–80 μ long.

I. Aecia chiefly fructicolous, scattered irregularly or crowded over the entire surface, cylindrical, 0.5–0.8 mm. in diameter, 2–4 mm. high; peridium yellowish-white, rather tough, rupturing at apex, not becoming lacerate along the sides, remaining tubular; peridial cells seen in both face and side views, not hygroscopic, remaining straight when wet, polygonal-oblong in face view, 25–35 by 65–100 μ, rhomboidal in side view, thick, 45–55 μ, the outer wall moderately thick, 5–8 μ, smooth, the inner wall very thick, 27–35 μ, moderately and closely verrucose with slightly irregular papillae, the side walls verrucose on the inner surface, similar to the inner wall, about two thirds of the surface smooth; aeciospores globoid, 23–27 by 25–31 μ; wall pale-yellow, 2–2.5 μ thick, finely verrucose, the pores obscure, scattered.

ON MALACEAE:
Amelanchier alnifolia Nutt., Colorado, Utah.
Amelanchier oreophila A. Nels., Colorado.
Amelanchier utahensis Koehne, New Mexico.

III. Telia caulicolous, from an annual or perennial mycelium, usually arising from between the scale-like leaves on the green twigs, often causing a yellowing of the leaves, more rarely on the woody branches, scattered or aggregated and often confluent about the entire margins of several adjacent scale-like leaves, pulvinate, oblong, about 0.4–1 mm. wide by 0.5–1.5 mm. long by 0.5–1 mm. high, reddish-brown; teliospores 2-celled, oblong-ellipsoid, 25–29 by 55–80 μ, roundish or often acutish at the apex, obtuse below, not or only slightly constricted at the septum; wall thin, about 1 μ, golden-yellow, the pores one in each cell, apical in the upper, near the pedicel in the lower cell; pedicel hyaline, cariotiform, swelling greatly next to the spore, 25–65 μ, very long.

ON JUNIPERACEAE:
Juniperus utahensis (Engelm.) Lemm. (*J. californica utahensis* Engelm., *Sabina utahensis* Rydb.), Colorado.
TYPE LOCALITY: Glenwood Springs, Colorado, on *Sabina utahensis*.
DISTRIBUTION: In the mountains of western Colorado, Utah, and New Mexico.
ILLUSTRATIONS: Bot. Gaz. **49**: *pl. 22, f. 15;* Bull. N. Y. Bot. Gard. **7**: 440, *f. 5; pl. 154, f. 45;* Mycologia **3**: 158, *f. 1d.*
EXSICCATI: Ellis & Ev. Fungi Columb. *1293*.

5. **Gymnosporangium Harknessianum** (Ellis & Ev.) Kern, Bull. N. Y. Bot. Gard. **7**: 441. 1911.

Aecidium Harknessianum Farl. Bibl. Index 1: 53, hyponym. 1905.
Roestelia Harknessiana Ellis & Ev.; Kern, Bull. Torrey Club **34**: 462. 1907.

O. Pycnia not seen.

I. Aecia chiefly fructicolous, evenly disposed, usually over the entire surface, cylindrical, 0.5–0.8 mm. in diameter, 4–7 mm. long; peridium golden-brown, tough, dehiscent at apex, not becoming lacerate along the sides, remaining tubular; peridial cells seen in both face and side views, not hygroscopic, remaining straight when wet, polygonal-oblong in face view, 40–65 by 90–112 μ, rhomboidal in side view, 58–74 μ thick, the outer wall moderately thick, 4–6 μ, smooth, the inner wall thick, 15–20 μ, rather coarsely and evenly verrucose with roundish or slightly irregular papillae, the side walls verrucose over the entire surface similar to the inner wall, papillae slightly less crowded toward outer wall; aeciospores globoid, 22–26 by 26–30 μ; wall light cinnamon-brown, 2–2.5 μ thick, finely verrucose, the pores several, scattered.

ON MALACEAE:
Amelanchier alnifolia Nutt., California.

III. Telia unknown.

TYPE LOCALITY: Klamath River, California, on *Amelanchier alnifolia*.
DISTRIBUTION: Known only from the type locality.
ILLUSTRATIONS: Bot. Gaz. **49**: *pl. 22, f. 16;* Bull. N. Y. Bot. Gard. **7**: 441, *f. o.*
EXSICCATI: Ellis & Ev. N. Am. Fungi *2714*.

6. **Gymnosporangium multiporum** Kern, Mycologia **1**: 210. 1909.

O and I. Pycnia and aecia unknown.

III. Telia caulicolous, from an annual or perennial mycelium, arising between the scale-like leaves on the green branches, scattered or aggregated and confluent, musciform, 0.5–1 mm. across by 0.5–0.8 mm. high, light chestnut-brown; teliospores 2-celled, ellipsoid, 20–24 by 45–51 μ, rounded both above and below, considerably constricted at the septum; wall rather thick, 1.5–2.5 μ, light cinnamon-brown, the pores 5–7 in each cell, large, evident, scattered; pedicel hyaline, cylindrical, uniform in diameter, 7–9 μ, very long.

ON JUNIPERACEAE:
Juniperus monosperma (Engelm.) Sarg. (*J. occidentalis monosperma* Engelm., *Sabina monosperma* Rydb.), Colorado.
Juniperus utahensis (Engelm.) Lemm. (*J. californica utahensis* Engelm., *Sabina utahensis* Rydb.), Colorado.
TYPE LOCALITY: Trinidad, Colorado, on *Sabina monosperma*.
DISTRIBUTION: Southern Colorado.
ILLUSTRATIONS: Mycologia **1**: *f. 2;* **3**: 158, *f. 1b;* Bull. N. Y. Bot. Gard. **7**: 441, *f. 7.*

7. **Gymnosporangium exiguum** Kern, Bull. Torrey Club **35**: 508. 1908.

O. Pycnia epiphyllous and fructicolous, gregarious, rather sparsely arranged in irregular groups about 1–4 mm. across, on discolored hypertrophied areas, prominent, conspicuous, honey-yellow soon becoming blackish, globoid or depressed-globoid, 150–165 μ in diameter by 100–130 μ high; ostiolar filaments 50–65 μ long.

I. Aecia hypophyllous and fructicolous, rather sparsely arranged in irregular groups, causing considerable hypertrophy of the veins, petioles, or fruit, cylindrical, 2–3 mm. high by 0.3–0.4 mm. in diameter; peridium rupturing at the apex, margin not splitting much, erect; peridial cells usually seen in face view, not hygroscopic, very broadly lanceolate, 29–40 by 70–90 μ, oblong in side view, 25–30 μ thick, the outer wall rather thin, about 3 μ, very

closely spinulose, the inner and side walls thick, 9–14 μ, sculptured like the outer wall but with longer papillae (up to 6 μ long); aeciospores globoid or broadly ellipsoid, 22–25 by 26–31 μ; wall cinnamon-brown, 2–3 μ thick, finely verrucose, the pores distinct, 6–8, scattered.

ON MALACEAE:
Crataegus Tracyi Ashe, Texas.

III. Telia foliicolous, from an annual mycelium, scattered, tongue-shaped or conical, small, 0.5–1 mm. thick by 1–1.5 mm. high, chestnut-brown; teliospores 2-celled, ellipsoid, 18–23 by 45–55 μ, rounded or slightly narrowed both above and below, slightly or not constricted at the septum; wall pale cinnamon-brown, rather thin, about 1.5 μ, uniform, the pores 2 in each cell near the septum; pedicel hyaline, cylindrical, 5–6 μ in diameter, long.

ON JUNIPERACEAE:
Juniperus mexicana Spreng. (*J. sabinoides* Nees, *Cupressus sabinoides* H.B.K.), Texas.
Juniperus pachyphlaea Torr. (*Sabina pachyphlaea* Ant.), Texas.
Juniperus virginiana L. (*Sabina virginiana* Ant.), Texas.
TYPE LOCALITY: Fredericksburg, Texas, on *Sabina virginiana*.
ILLUSTRATIONS: Bot. Gaz. 49: *pl. 22, f. 17;* Bull. N. Y. Bot. Gard. 7: 442, *f. 8.*
DISTRIBUTION: Central and western Texas.
EXSICCATI: Barth. N. Am. Ured. 7.

8. **Gymnosporangium Davisii** Kern, Bull. Torrey Club **35**: 507. 1908.

O. Pycnia epiphyllous, numerous, gregarious, crowded in groups 1–2 mm. across, on discolored areas 3–10 mm. across, prominent, conspicuous, punctiform, honey-yellow becoming blackish-brown, slightly flattened-globoid, 160–185 μ in diameter by 130–150 μ high; ostiolar filaments 30–45 μ long.

I. Aecia hypophyllous, crowded in irregular groups or rarely annular groups 1–4 mm. across, on thickened discolored spots, cylindrical, acute at apex, 1.5–3 mm. high by 0.4–0.6 mm. in diameter; peridium very tardily dehiscent at apex, finally becoming lacerate along the sides; peridial cells seen in both face and side views, not hygroscopic, remaining straight when wet, broadly lanceolate in face view, 19–26 by 67–87 μ, rhomboidal in side view, 22–32 μ thick, the outer wall rather thin, 1.5–2 μ, smooth, the inner and side walls rather thick, 5–8 μ, rather moderately rugose with closely set very narrow ridges of varying length; aeciospores globoid, 19–25 by 23–27 μ; wall dark cinnamon-brown, rather thin, 1.5–2 μ, rather finely verrucose, the pores 8–10, scattered.

ON MALACEAE:
Aronia arbutifolia (L. f.) Ell. (*Pyrus arbutifolia* L. f.), Maine.
Aronia atropurpurea Britton, Maine.
Aronia nigra (Willd.) Koehne, Maine, Michigan, Wisconsin.

III. Telia chiefly epiphyllous, occasionally on the small stems at the bases of the leaves, from a perennial (?) mycelium, hemispherical, 0.5–1 mm. high, oval or oblong, 0.7–1 mm. broad by 1–2 mm. long, light chocolate-brown, ruptured epidermis conspicuous; teliospores 2-celled, broadly ellipsoid in general outline, 18–28 by 40–55 μ, usually narrowed below, often attenuate at the apex and sometimes considerably enlarged near the septum in one or two places on one or both cells owing to the presence of hyaline papillae over the germ-pores, slightly or not constricted at the septum; wall cinnamon-brown, thin, 1–1.5 μ, the papillae 4–7 μ, the pores 1 or 2 in each cell, apical or near the septum; pedicel cylindrical, uniform, 3–5 μ in diameter, moderately long.

ON JUNIPERACEAE:
Juniperus sibirica Burgsd. (*J. nana* Willd.), Maine, Wisconsin.
TYPE LOCALITY: Wind Lake, Racine County, Wisconsin, on *Juniperus sibirica*.
DISTRIBUTION: Maine to Wisconsin.
ILLUSTRATIONS: Bull. N. Y. Bot. Gard. 7: 446, *f. 13; pl. 154, f. 46.*

9. **Gymnosporangium juvenescens** Kern, Bull. N. Y. Bot. Gard. 7: 448. 1911.

O. Pycnia epiphyllous, numerous, gregarious, rather thickly crowded in groups 0.5–1.5 mm. across, on discolored spots, rather conspicuous, honey-yellow becoming blackish-brown, globoid, 120–145 μ in diameter by 110–145 μ high; ostiolar filaments 65–80 μ long.

I. Aecia chiefly hypophyllous, usually rather few, in annular groups 1–2 mm. across, cylindrical, 2–4 mm. high by 0.3–0.4 mm. in diameter; peridium tardily dehiscent at apex, first rupturing by longitudinal slits along the sides; peridial cells seen in both face and side views, not hygroscopic, remaining straight when wet, lanceolate-oblong in face view, 16–23 by 65–110 μ, linear-rhomboidal in side view, 17–27 μ thick, the outer wall rather thin, 1–1.5 μ, smooth, the inner and side walls rather thick, 5–7 μ, finely and closely verrucose-rugose with irregular and oftentimes ridge-like papillae; aeciospores globoid, 18–26 by 21–30 μ; wall chestnut-brown, 2–3 μ thick, finely verrucose, the pores 8–10, scattered.

ON MALACEAE:
Amelanchier alnifolia Nutt., Colorado, Montana, Nebraska, South Dakota, Wyoming.
Amelanchier florida Lindl., Wyoming; British Columbia.
Amelanchier oreophila A. Nels., Colorado.
Amelanchier polycarpa Greene, Colorado, Wyoming.
Amelanchier pumila Nutt., Alberta.

III. Telia caulicolous, from a perennial mycelium often causing a fasciation of the young shoots and forming witches' brooms, usually the leaves of affected branches taking on the subulate juvenile form, sori usually scattered, apparently arising from the axils of the leaves, hemispherical, 1–2 mm. across by 1–1.5 mm. high, cinnamon-brown becoming yellowish and pulverulent by germination, ruptured epidermal tissues conspicuous; teliospores 2-celled, ellipsoid, 18–26 by 39–52 μ, slightly or not constricted at the septum, usually rounded both above and below; wall pale cinnamon-brown, rather thin, 1–2 μ, occasionally slightly thickened over the germ-pores, the pores 2 in each cell, near the septum, or often only one in the upper cell and apical; pedicel cylindrical, uniform, 5–8 μ in diameter, very long.

ON JUNIPERACEAE:
Juniperus scopulorum Sarg. (*Sabina scopulorum* Rydb.), Colorado.
Juniperus virginiana L. (*Sabina virginiana* Ant.), Nebraska, Wisconsin.
TYPE LOCALITY: Boulder, Colorado, on *Juniperus scopulorum*.
DISTRIBUTION: From British Columbia and Alberta southeast to the Black Hills of South Dakota and to Colorado, and locally in Nebraska and Wisconsin.
ILLUSTRATIONS: Bot. Gaz. **49**: *pl. 22, f. 13*; Bull. N. Y. Bot. Gard. **7**: *pl. 156, f. 53*; Mycologia **3**: 158, *f. 1c*; *pl. 48, f. 3*.
EXSICCATI: Ellis & Ev. N. Am. Fungi *3146*; Ellis & Ev. Fungi Columb. *1676*; D. Griff. W. Am. Fungi *246, 264*; Barth. Fungi Columb. *2527, 2580, 2977*; Barth. N. Am. Ured. *108*; Vesterg. Micr. Rar. Sel. *1189*.

10. **Gymnosporangium Kernianum** Bethel, Mycologia 3: 157. 1911.

O and I. Pycnia and aecia uncertain.

ON MALACEAE:
Amelanchier sp. Proven by culture as to host, but without maturing aecia.

III. Telia caulicolous, from a perennial mycelium, arising between the scale-like leaves on the green twigs, causing a fasciation of the young shoots and forming globose witches' brooms 15–45 dm. in diameter, not causing a reversion to the juvenile form, scattered, usually solitary, hemispherical, 0.5–0.8 mm. across, rather compact, dark reddish-brown; teliospores chiefly 2-celled, narrowly ellipsoid, 21–26 by 55–74 μ, narrowed or sometimes rounded at both ends, slightly or not constricted at the septum; wall thin, about 1 μ, yellowish, the pores usually 2 in each cell, near the septum; pedicel cylindrical.

ON JUNIPERACEAE:
Juniperus utahensis (Engelm.) Lemm., Colorado.
TYPE LOCALITY: Paonia, Colorado, on *Juniperus utahensis*.
DISTRIBUTION: Western Colorado.
ILLUSTRATIONS: Mycologia **3**: 158, *f. 1a*; *pl. 48, f. 1a, 2*; Bull. N. Y. Bot. Gard. **7**: *pl. 156, f. 52*.

11. **Gymnosporangium trachysorum** Kern; Arth. Mycologia 2: 237. 1910.

O. Pycnia epiphyllous, gregarious, in groups 1–2 mm. across, on discolored spots, prominent, conspicuous, punctiform, orange-yellow becoming brownish-black, globoid, 144–165 μ in diameter by 112–128 μ high; ostiolar filaments 75–90 μ long.

I. Aecia hypophyllous, gregarious, rather few in irregular groups 2–5 mm. across, on discolored slightly thickened spots 5–10 mm. or more across, cylindrical, 2–4 mm. high, 0.2–0.3 mm. in diameter; peridium remaining horn-like, finally rupturing by longitudinal slits along the sides; peridial cells seen in both face and side views, not hygroscopic, remaining

straight when wet, long and narrow in side view, 15–19 by 32–90 μ, lanceolate in face view, 19–23 μ broad, the outer wall rather thin, 1.5–2 μ, nearly or quite smooth, the inner and side walls moderately thick, 3–6 μ, closely subspinulose with rather short spine-like papillae, interspersed with lower oval or ridge-like papillae, extending obliquely clear across the side walls, sometimes extending on to the outer wall; aeciospores globoid or ellipsoid, 15–23 by 18-27 μ; wall chestnut-brown, rather thick, about 2.5–3 μ, very minutely verrucose, appearing almost smooth, the pores about 6, scattered.

ON MALACEAE:
Crataegus flavo-carnis Ashe, North Carolina.
Crataegus Marshallii Eggl. (*C. apiifolia* Michx.), Alabama, Louisiana.
Crataegus Phaenopyrum (L. f.) Medic. (*C. cordata* Ait.), North Carolina.

III. Telia caulicolous, from a perennial mycelium, appearing on abruptly fusiform or globoid somewhat gall-like enlargements 0.5–1.5 cm. in diameter by 0.5–3 cm. long, unevenly disposed, sometimes closely aggregated, often separated by the scars of the sori of previous seasons, more or less wedge-shaped, often irregular and somewhat lacunose, when fully mature 1.5–2 mm. broad by 2–4 mm. long at base by 6–10 mm. high, the surface very rough with irregular warts and ridges, dark chestnut-brown; teliospores 2-celled, ellipsoid, 18–21 by 37–45 μ; wall cinnamon-brown, moderately thin, 1.5–2.5 μ, varying in thickness on different spores, the pores 1 or 2 in each cell, near the septum; pedicel hyaline, cylindrical, uniform, 4–5 μ in diameter, very long.

ON JUNIPERACEAE:
Juniperus virginiana L. (*Sabina virginiana* Ant.), Mississippi, South Carolina.
TYPE LOCALITY: Santee Canal, South Carolina, on *Juniperus virginiana*.
DISTRIBUTION: From North Carolina southwest to Mississippi and Louisiana.
ILLUSTRATION: Bull. N. Y. Bot. Gard. 7: 450, *f. 15*.

12. **Gymnosporangium tubulatum** Kern, Bull. N. Y. Bot. Gard. 7: 451. 1911.

Roestelia tubulata Kern; M. E. Jones, Bull. Univ. Mont. 61: 64. 1910.

O. Pycnia epiphyllous, rather numerous, gregarious, in irregular groups 1–2 mm. across, on discolored spots 4–8 mm. across, prominent, conspicuous, honey-yellow becoming blackish, flattened-globose, 190–225 μ in diameter, by 128–160 μ high; ostiolar filaments 50–65 μ long.

I. Aecia chiefly hypophyllous, crowded in irregular groups, on thickened discolored spots, cylindrical, acutish at apex, 2–3.5 mm. high by 0.2–0.4 mm. in diameter; peridium firm, tardily dehiscent by longitudinal slits in the lower part; peridial cells seen in both face and side views, not hygroscopic, remaining straight when wet, fusiform-oblong in face view, 18–26 by 48–80 μ, oblong in side view, 16–24 μ thick, the outer wall rather thin, 1–1.5 μ, smooth, the inner and side walls moderately thick, 5–6 μ, rather densely and moderately rugose with ridges of varying length; aeciospores globoid or broadly ellipsoid, 18–22 by 21–28 μ; wall light chestnut-brown, 1.5–2.5 μ thick, finely verrucose, the pores evident, 6–8, scattered.

ON MALACEAE:
Crataegus Douglasii Lindl. (*C. brevispina* Dougl.), Montana.
Crataegus Williamsii Eggl., Montana.

III. Telia unknown.

TYPE LOCALITY: Near Flathead Lake, Montana, on *Crataegus Douglasii*.
DISTRIBUTION: Western Montana.

13. **Gymnosporangium Botryapites** (Schw.) Kern, Bull. Torrey Club 35: 506. 1908.

Caeoma (*Roestelia*) *Botryapites* Schw. Trans. Am. Phil. Soc. II. 4: 294. 1832.
Ceratites (*Caeoma*) *Botryapites* Schw. Trans. Am. Phil. Soc. II. 4: 310. 1832.
Gymnosporangium biseptatum Ellis, Bull. Torrey Club 5: 46. 1874.
Roestelia Ellisii Peck, Bull. Torrey Club 6: 13. 1875.
Roestelia Botryapites Cooke & Ellis, Grevillea 5: 34. 1876.
Aecidium Botryapites J. L. Bennett, Pl. Rhode Island 89. 1888.
Puccinia Botryapites Kuntze, Rev. Gen. 3^3: 508. 1898.
Tremella Botryapites Arth. Proc. Ind. Acad. Sci. 1900: 135. 1901.

O. Pycnia epiphyllous, few, gregarious, in small groups 0.7–1.5 mm. across, punctiform, honey-yellow becoming blackish, conical, 128–190 μ in diameter by 64–112 μ high; ostiolar filaments 30–65 μ long.

I. Aecia hypophyllous, few, usually aggregated in groups of 2–8, rarely solitary, borne in gall-like, pyriform protuberances 1–1.5 mm. in diameter by 1.5–3 mm. high, cylindrical, 0.5–0.8 mm. in diameter by 2–4 mm. high; peridium soon becoming finely cancellate, not dehiscent at apex; peridial cells cylindrical, long and narrow, hypha-like, 9–14 μ in diameter by 145–190 μ long, often irregularly bent, the outer, inner, and side walls of equal thickness, about 1.5–2 μ, whole surface smooth; aeciospores globoid, small, 15–17 by 16–22 μ; wall dark cinnamon-brown, 2.5–3 μ thick, moderately verrucose, the pores obscure, numerous, scattered.

ON MALACEAE:

Amelanchier canadensis (L.) Medic. (*A. Botryapium* DC., *Aronia Botryapium* Pers.), Connecticut, Massachusetts, New Jersey, Pennsylvania.

Amelanchier intermedia Spach (*A. Botryapium* Hook. not DC.), Massachusetts, New Jersey.

III. Telia caulicolous, from a perennial mycelium, appearing on fusiform swellings, scattered, oval or irregular, about 1.5–3 mm. wide by 2–7 mm. long, often confluent, hemispherical, 3–5 mm. or more high, chestnut-brown when fully mature, becoming rugose and light-yellow by germination; teliospores 2–4-celled, linear-oblong, 13–19 by 35–77 μ, usually rounded above, somewhat narrowed below, slightly constricted at the septa; wall pale-yellow, about 1–1.5 μ thick, the pores 2 in each cell, near the septa; pedicel cylindrical, uniform, 5–6 μ in diameter, very long.

ON JUNIPERACEAE:

Chamaecyparis thyoides (L.) B.S.P. (*C. sphaeroidea* Spach., *Cupressus thyoides* L.), Alabama, Connecticut, Delaware, Massachusetts, New Jersey.

TYPE LOCALITY: Bethlehem, Pennsylvania, on *Aronia Botryapium* (*Amelanchier canadensis*).

DISTRIBUTION: Along the Atlantic coast from Massachusetts to New Jersey and Pennsylvania, and in southern Alabama.

ILLUSTRATIONS: Hedwigia **34**: *3, f. 10;* Farl. Gymnosp. U. S. *pl. 2, f. 18–21;* Bot. Gaz. **49**: *pl. 22, f. 12;* Bull. N. Y. Bot. Gard. **7**: 452, *f. 17; pl. 155, f. 48.*

EXSICCATI: Seym. & Earle, Econ. Fungi *243, 245;* Rab.-Wint. Fungi Eur. *2922;* Ellis, N. Am. Fungi *272, 1087;* Ellis & Ev. Fungi Columb. *1075;* Thüm. Myc. Univ. *431;* Roum. Fungi Sel. *4514.*

14. **Gymnosporangium Nidus-avis** Thaxter, Bull. Conn. Exp. Sta. 107 : 3. 1891.

Gymnosporangium conicum Farl. Gymnosp. U. S. 23. 1880. Not *G. conicum* Hedw. f. 1805.
Roestelia Nidus-avis Thaxter, Bull. Conn. Exp. Sta. 107 : 5. 1891.
Puccinia Nidus-avis Kuntze, Rev. Gen. 3^3 : 507. 1898.
Tremella Nidus-avis Arth. Proc. Ind. Acad. Sci. **1900** : 136. 1901.
Aecidium Nidus-avis Farl. Bibl. Index 1 : 68. 1905.

O. Pycnia fructicolous and epiphyllous, gregarious, in small groups on slightly hypertrophied areas, noticeable, punctiform, honey-yellow becoming blackish, flattened-globoid, 120–155 μ in diameter by 80–112 μ high; ostiolar filaments 45–65 μ long.

I. Aecia amphigenous, especially fructicolous and caulicolous, aggregated on hypertrophied areas 2–5 mm. across on the leaves, occupying part or all of the surface on the fruits, cylindrical, 2–4 mm. high by 0.4–0.7 mm. in diameter; peridium soon becoming irregularly lacerate, usually to base, slightly spreading; peridial cells seen in both face and side views, not hygroscopic, remaining straight when wet, lanceolate in face view, 15–23 by 55–88 μ, linear in side view, 14–18 μ thick, the outer wall rather thin, 1–1.5 μ, smooth, the inner and side walls moderately thick, 5–7 μ, coarsely rugose with rather narrow ridges with separate roundish or elongate ridge-like papillae interspersed; aeciospores globoid or broadly ellipsoid, 18–23 by 23–28 μ; wall cinnamon-brown, rather thick, 2.5–4 μ, very finely verrucose, appearing almost smooth when wet, the pores 8–10, scattered.

ON MALACEAE:

Amelanchier canadensis (L.) Medic. (*A. Botryapium* DC.), Connecticut, Illinois, Iowa, Massachusetts, North Carolina, Vermont, Wisconsin.

Amelanchier erecta Blanchard, Ohio.

Amelanchier intermedia Spach (*A. Botryapium* Hook. not DC.), Connecticut, Massachusetts, New York, Pennsylvania; Ontario.

Amelanchier oblongifolia (T. & G.) Roem., Massachusetts.

Amelanchier vulgaris Moench (cultivated), Massachusetts.

Cydonia vulgaris (L.) Pers., Connecticut.

III. Telia caulicolous, from a perennial mycelium which often dwarfs the young shoots and causes bird's-nest distortions, usually causing a reversion of the leaves to the juvenile form, sometimes appearing on isolated areas on the larger branches and producing gradual enlargements, solitary or rarely confluent, of variable shape and size, roundish to oval on the young shoots, 1–2 mm. across, oval to narrowly elliptical on the woody branches, 1.5–3 mm. wide by 2–7 mm. long, pulvinate and low when young, later becoming hemispherical, dark reddish-brown becoming yellowish by germination, ruptured epidermal tissues very conspicuous; teliospores two-celled, ellipsoid, 16–23 by 39–55 μ, rounded or somewhat narrowed both above and below; wall pale cinnamon-brown, rather thin, 1–1.5 μ, very slightly thicker above, the pores one in a cell, apical; pedicel cylindrical, mostly uniform, 4–7 μ in diameter, very long.

ON JUNIPERACEAE:
Juniperus virginiana L. (*Sabina virginiana* Ant.), Alabama, Connecticut, Delaware, District of Columbia, Florida, Georgia, Illinois, Iowa, Maryland, Massachusetts, Mississippi, New Jersey, North Carolina, South Carolina, Vermont, Virginia.
TYPE LOCALITY: Connecticut, on *Juniperus virginiana*.
DISTRIBUTION: Massachusetts west to Wisconsin and Iowa, south to Florida and Mississippi.
ILLUSTRATIONS: Bot. Gaz. **49**: *pl. 22, f. 10*; Bull. N. Y. Bot. Gard. **7**: 453, *f. 18; pl. 157, f. 54, 55*.
EXSICCATI: Rab.-Wint. Fungi Eur. *2923*; Ellis, N. Am. Fungi *1086c, 1083b*; Ellis & Ev. N. Am. Fungi *3145*; Ellis & Ev. Fungi Columb. *1623*; Seym. & Earle, Econ. Fungi *239, 240*; Kellerm. Ohio Fungi *185*; Rav. Fungi Am. *791*; Rav. Fungi Car. 5: *87*.

15. **Gymnosporangium germinale** (Schw.) Kern, Bull. Torrey Club **35**: 506. 1908.

Caeoma (*Peridermium*) *germinale* Schw. Trans. Am. Phil. Soc. II. **4**: 294. 1832.
Peridermium (*Caeoma*) *germinale* Schw. Trans. Am. Phil. Soc. II. **4**: 310. 1832.
Podisoma Gymnosporangium clavipes Cooke & Peck; Cooke, Jour. Quek. Club **2**: 267. 1871.
Gymnosporangium clavipes Cooke & Peck; Peck, Ann. Rep. N. Y. State Mus. **25**: 89. 1873.
Roestelia aurantiaca Peck, Bull. Buffalo Soc. Nat. Sci. **1**: 68. 1873.
Puccinia clavipes Kuntze, Rev. Gen. **3**^{3}: 507. 1898.
Tremella clavipes Arth. Proc. Ind. Acad. Sci. **1900**: 135. 1901.
Aecidium aurantiacum Farl. Bibl. Index **1**: 19. 1905. Not *A. aurantiacum* Bon. 1860.
Aecidium germinale Arth. Résult. Sci. Congr. Bot. Vienne 343. 1906.

O. Pycnia chiefly fructicolous, gregarious, in irregular groups on slightly hypertrophied areas occupying part or all of the surface, prominent, conspicuous, honey-yellow becoming blackish, slightly flattened-globose, large, 160–270 μ in diameter by 150–230 μ high; ostiolar filaments 90–150 μ long.

I. Aecia fructicolous and caulicolous, crowded on hypertrophied areas of variable size on the twigs and peduncles, occupying part or usually all of the surface on the fruits, cylindric, 1.5–3 mm. high by 0.3–0.5 mm. in diameter; peridium whitish, becoming coarsely lacerate sometimes to base, erect or spreading; peridial cells seen in both face and side views, not hygroscopic, remaining straight when wet, polygonal-ovate or polygonal-oblong in face view, 19–39 by 45–95 μ, rhomboidal in side view, 25–40 μ thick, the outer wall moderately thick, 3–5 μ, smooth, the inner wall very thick, 13–23 μ, coarsely verrucose with rather loosely set, large, very irregularly branched papillae, the side walls verrucose on the inner half similar to the inner wall; aeciospores globoid, large, 21–32 by 24–39 μ; wall pale-yellow, thick, 3–4.5μ, rather coarsely verrucose with crowded, slightly irregular papillae, sometimes appearing reticulate, the pores 6–10, scattered, very obscure.

ON MALACEAE:
Amelanchier canadensis (L.) Medic. (*A. Botryapium* DC.), Connecticut, Maine, New York; Newfoundland; Ontario, Quebec.
Amelanchier erecta Blanchard, Michigan.
Amelanchier intermedia Spach (*A. Botryapium* Hook. not DC.), Maine, Massachusetts, Michigan, New York; New Brunswick.
Amelanchier oligocarpa (Michx.) Roem., Quebec.
Amelanchier oblongifolia (T. & G.) Roem., Maine, Massachusetts, Michigan, Wisconsin.
Amelanchier rotundifolia (Michx.) Roem., Ontario.
Aronia arbutifolia (L.) Ell., Maine, Massachusetts; New Brunswick.
Aronia atropurpurea Britton, Maine.
Aronia monstrosa Zabel (*Sorbus americana* × *Aronia arbutifolia*), Maine.
Aronia nigra (Willd.) Britton, Maine; Ontario.
Choenomeles japonica (Thunb.) Lindl. (*Cydonia japonica* Pers.), New Jersey.
Crataegus colonica Beadle, South Carolina.
Crataegus Crus-galli L., Connecticut, Georgia, Kentucky, Massachusetts, Mississippi, North Carolina, Ohio, Pennsylvania, Virginia.

Crataegus dispar Beadle, South Carolina.
Crataegus flava Ait., Alabama, Florida, South Carolina.
Crataegus Jonesae Sarg., Maine.
Crataegus mollis (T. & G.) Scheele, Illinois, Indiana.
Crataegus Phaenopyrum (L. f.) Medic. (*C. cordata* Ait.), Tennessee.
Crataegus punctata Jacq., New York, North Carolina; Ontario.
Crataegus Reverchoni Sarg., Texas.
Crataegus rotundifolia Moench, Maine, New York.
Crataegus spathulata Michx., Alabama, North Carolina, South Carolina, Tennessee.
Crataegus sp., Arkansas, Louisiana, New Jersey.
Cydonia vulgaris (L.) Pers. (*Pyrus vulgaris* L.), Alabama, Connecticut, Delaware, Maine, Maryland, Massachusetts, Michigan, Mississippi, New York, Vermont.
Malus Malus (L.) Britton (*Pyrus Malus* L.), Massachusetts.

III. Telia caulicolous, from a perennial mycelium, appearing on slight fusiform swellings, usually aggregated, roundish, 1–4 mm. across, often confluent, hemispherical, 1–3 mm. high, orange-brown; teliospores 2-celled, ellipsoid, 18–26 by 35–51 μ, roundish or somewhat acutish above, obtuse below, slightly or not constricted at the septum; wall yellowish, thin, 1–2 μ, slightly thicker at apex, 2–3 μ, the pores 1 in each cell, apical in the upper, near the pedicel in the lower cell; pedicels carotiform, 9–19 μ in diameter near the spore, very long.

ON JUNIPERACEAE:
Juniperus communis L., Maine, Massachusetts.
Juniperus sibirica Burgsd. (*J. nana* Willd.), Illinois, Michigan, New York, Wisconsin.
Juniperus virginiana L. (*Sabina virginiana* Ant.), Alabama, Connecticut, Delaware, District of Columbia, Iowa, Kentucky, Maryland, Massachusetts, Mississippi, New Jersey, New York, North Carolina, Ohio, Pennsylvania, South Carolina, Tennessee, Virginia.

TYPE LOCALITY: Philadelphia, Pennsylvania, "in germinibus Rosae," error for *Crataegus* sp.

DISTRIBUTION: From Maine west to northern peninsula of Michigan and to Iowa, south to Texas and northern Florida.

ILLUSTRATIONS: Hedwigia **34**: 3, *f. 7*; Bot. Gaz. **49**: *pl. 21, f. 9*; Bull. N. Y. Bot. Gard. **7**: 455, *f. 19*; *pl. 155, f. 50, 51.*

EXSICCATI: Seym. & Earle, Econ. Fungi *234*, *235*, *236*, *237* (in part), *238*; Rav. Fungi Am. *271*, *272*, *502*; Ellis, N. Am. Fungi *1083a*, *1084a, b*; Ellis & Ev. N. Am. Fungi *2224*; Ellis & Ev. Fungi Columb. *54*, *1732*; Thüm. Myc. Univ. *44*; Kellerm. Ohio Fungi *21*.

16. **Gymnosporangium cornutum** (Pers.) Arth.

Mycologia **1**: 240. 1909.

Aecidium cornutum Pers. in J. F. Gmel. Syst. Nat. **2**: 1472. 1791.
Caeoma cornutum Schlecht. Fl. Berol. **2**: 111. 1824.
Caeoma cylindrites Link, in Willd. Sp. Pl. 6^2: 64. 1825.
Gymnosporangium Juniperi Link, in Willd. Sp. Pl. 6^2: 127. 1825.
Centridium Sorbi Chev. Fl. Paris **1**: 383. 1826.
Gymnosporangium aurantiacum Chev. Fl. Paris **1**: 424. 1826.
Roestelia cornuta Fries, Summa Veg. Scand. 510. 1849.
Ceratitium cornutum Rab. Bot. Zeit. **9**: 452. 1851.
Podisoma juniperinum Oerst. Overs. Danske Vid. Selsk. Forh. **1866**: 191. 1866.

O. Pycnia epiphyllous, numerous, gregarious, crowded in groups 1.5–5 mm. across, on discolored areas 3–15 mm. across, prominent, conspicuous, punctiform, honey-yellow becoming blackish-brown.

I. Aecia chiefly hypophyllous, crowded in irregular or often annular groups 3–10 mm. across, on larger thickened, discolored areas, cylindrical, somewhat attenuate above, acute at apex, 3–5 mm. high, 0.4–0.6 mm. in diameter; peridium rupturing rather tardily at apex, becoming somewhat but not deeply lacerate; peridial cells seen in both face and side views, not hygroscopic, remaining straight when wet, broadly lanceolate in face view, 19–29 by 60–110 μ, rhomboidal in side view, 30–35 μ thick, the outer wall rather thin, about 2 μ, smooth, the inner and side walls thick, 8–12 μ, rather coarsely rugose with short ridge-like papillae; aeciospores globoid, 18–25 by 21–29 μ; wall light chestnut-brown, moderately thin, 2–2.5 μ, rather finely verrucose, the pores 8–10, scattered.

ON MALACEAE:
Sorbus americana Marsh., Maine, Michigan, New Hampshire, New York; Newfoundland, Ontario.
Sorbus Aucuparia L., Michigan.
Sorbus scopulina Greene (*S. sambucifolia* A. Gray, not Cham. & Schlecht.), Colorado, Maine, Wisconsin, Wyoming; Greenland, Ontario, Quebec.

III. Telia chiefly caulicolous, from a perennial mycelium, usually appearing on slight fusiform enlargements of the smaller woody branches, occasionally also on the leaves,

scattered, solitary or often aggregated and confluent, very irregular, varying greatly in size, 1–3 mm. across, at first somewhat applanate and rather low or pulvinate, becoming considerably expanded when fully mature, light chocolate-brown becoming yellowish by germination, the ruptured bark and cortical tissues conspicuous; teliospores 2-celled, broadly ellipsoid in general outline, 16–22 by 31–42 μ, usually narrowed below, sometimes rounded above or more often slightly attenuate at the apex and sometimes slightly enlarged near the septum in one or two places on one or both cells owing to the presence of hyaline papillae over the germ-pores, not or only rarely constricted at the septum; wall light cinnamon-brown, thin, about 1 μ, papillae 2–5 μ, the pores 1 or 2 in each cell, apical or near the septum; pedicel cylindrical, uniform, 4–7 μ in diameter, rather long.

ON JUNIPERACEAE:
Juniperus sibirica Burgsd. (*J. nana* Willd.), Colorado, Michigan.
TYPE LOCALITY: Norway, on *Sorbus Aucuparia*.
DISTRIBUTION: Greenland south to New York and Wisconsin, and in mountains of Wyoming and Colorado; also in Europe.
ILLUSTRATIONS: Overs. Danske Vid. Selsk. Forh. 1866: *pl. 3–4*; E. & P. Nat. Pfl. 1^{1**}: *f. 33, A, B*; Grev. Scot. Crypt. Fl. *pl. 180*; Bot. Gaz. 49: *pl. 22, f. 14*; Bull. N. Y. Bot. Gard. 7: 455, *f. 11*; *pl. 152, f. 39*; *pl. 160, f. 63*.
EXSICCATI: Ellis, N. Am. Fungi *1089*; Seym. & Earle, Econ. Fungi *248x*.

17. **Gymnosporangium exterum** Arth. & Kern; Arth.

Mycologia **1**: 254. 1909.

O. Pycnia epiphyllous, rather few, gregarious, very sparsely disposed in indefinite groups 2–6 mm. across, on larger discolored spots, prominent, conspicuous, punctiform, flattened-globoid, 95–125 μ in diameter by 65–90 μ high; ostiolar filaments 48–65 μ long.

I. Aecia hypophyllous, gregarious, very sparsely disposed in large groups 4–10 mm. or more across, on larger discolored areas, 0.1–0.3 mm. in diameter by 0.5–0.8 mm. high; peridium soon becoming rather finely lacerate almost to base, spreading but not revolute; peridial cells usually seen only in face view, not hygroscopic, remaining straight when wet, lanceolate in face view, 10–18 by 58–100 μ, the inner wall rugose with rather narrow ridges running downward and outward, side view only rarely observed, the side walls rugose with transverse ridges extending clear across, 3–5 μ thick; aeciospores broadly ellipsoid or globoid, 17–21 by 21–26 μ; wall very pale cinnamon-brown, moderately thick, 2–2.5 μ, very finely verrucose, the pores evident, 8–10, scattered.

ON ROSACEAE:
Porteranthus stipulatus (Muhl.) Britton (*Gillenia stipulacea* Nutt., *Spiraea stipulata* Muhl.), Missouri, Kentucky.

III. Telia caulicolous, from a perennial mycelium, appearing on fusiform swellings 2–6 cm. long by 0.5–1.5 cm. or more in diameter, causing a considerable roughening and exfoliation of the bark, flattened and applanate, irregular and indefinite in outline, usually anastomosing over practically the whole surface of a swelling, light chocolate-brown becoming yellowish by germination; teliospores 2-celled, ellipsoid, 18–23 by 32–42 μ, rounded or sometimes narrowed above and below, very slightly or not at all constricted at the septum; wall light cinnamon-brown, rather thin, 1–1.5 μ, usually slightly thicker at apex, the pores 1 in a cell, apical; pedicel cylindrical, uniform, slender, 3–4 μ in diameter, very long.

ON JUNIPERACEAE:
Juniperus virginiana L. (*Sabina virginiana* Ant.), Kentucky.
TYPE LOCALITY: Mammoth Cave, Kentucky, on *Juniperus virginiana*.
DISTRIBUTION: Small area from central Kentucky to southeastern Missouri.
ILLUSTRATION: Bull. N. Y. Bot. Gard. 7: *pl. 157, f. 56*.
EXSICCATI: Rab.-Wint. Fungi Eur. *3323*.

18. **Gymnosporangium juniperinum** (L.) Mart. Fl. Crypt. Erlang. 333. 1817.

Tremella juniperina L. Sp. Pl. 1157. 1753.
Aecidium penicillatum Pers. in J. F. Gmel. Syst. Nat. **2**: 1472. 1791.
Caeoma penicillatum Schlecht. Fl. Berol. **2**: 111. 1824.
Centridium Ariae Desmaz. Pl. Crypt. *1378*. 1845.
Roestelia penicillata Fries, Summa Veg. Scand. 510. 1849.
Ceratitium penicillatum Rab. Bot. Zeit. **9**: 452. 1851.

? *Podisoma Gymnosporangium* Bon. Handb. Myk. 148. 1851.
Podisoma tremelloides A. Br. Bot. Zeit. **25**: 94. 1867.
Gymnosporangium tremelloides R. Hartig, Lehrb. Baumkr. 133. 1882.
Puccinia juniperina Kuntze, Rev. Gen. 3^3: 507. 1898.
Tremella penicillata Arth. Proc. Ind. Acad. Sci. **1900**: 135. 1901.
Roestelia fimbriata Arth. Bull. Torrey Club **28**: 666. 1901.
Aecidium fimbriatum Farl. Bibl. Index 1: 44. 1905.
Aecidium juniperinum Arth. Résult. Sci. Congr. Bot. Vienne 343. 1906.
Gymnosporangium penicillatum Liro, Bidr. Finl. Nat. Folk **65**: 405. 1908.

O. Pycnia epiphyllous, gregarious, in small groups 0.5–2 mm. across, on discolored spots 2–7 mm. across, prominent, conspicuous, honey-yellow becoming blackish, hemispherical, 140–160 μ in diameter by 75–90 μ high; ostiolar filaments 45–65 μ long.

I. Aecia hypophyllous, in annular or crowded groups 2–5 mm. across, on larger thickened discolored spots 4–10 mm. across, at first cylindrical, 0.5–1.5 mm. high, 0.5–1 mm. in diameter; peridium soon becoming finely fimbriate to base, somewhat twisted or incurved; peridial cells usually seen only in side view, rhomboidal, very thick, 30–35 by 60–90 μ, somewhat hygroscopic, becoming very slightly curved when wet, the outer wall rather thin, 2–3 μ, smooth, the inner wall rather thick, 7–10 μ, rugose, the side walls very coarsely rugose with thick, somewhat irregular ridges running from the inner side transversely and slightly downward almost to the outer side with roundish or elongate ridge-like papillae interspersed; aeciospores globoid, very large, 28–35 by 30–45 μ; wall chestnut-brown, thick, 3–5 μ, rather finely verrucose, the pores numerous, scattered, obscure.

ON MALACEAE:
Sorbus occidentalis (S. Wats.) Greene, British Columbia.
Sorbus scopulina Greene, Colorado, Montana, Washington, Wyoming; British Columbia.
Sorbus sitchensis Roem., Wyoming; British Columbia.

III. Telia caulicolous, from a perennial mycelium, causing premature enlargement of the branches, appearing on hemispherical swellings 1–4 cm. long breaking forth along the sides of the larger branches, or on subglobose galls 1.5–2 cm. in diameter on the smaller branches, applanate, indefinite, usually of considerable size, often covering the whole hypertrophied area, spreading out and becoming patelliform when fully mature, chocolate-brown becoming yellowish and pulverulent by germination; teliospores 2-celled, ellipsoid, 18–28 by 42–61 μ, usually slightly narrowed both above and below, slightly or not constricted at the septum; wall cinnamon-brown, uniform, 1–1.5 μ thick, the pores in the upper cell usually 3, 1 apical and 2 near the septum, in the lower cell 2 near the septum; pedicel cylindrical, 6–10 μ in diameter, very long.

ON JUNIPERACEAE:
Juniperus sibirica Burgsd. (*J. nana* Willd.), Colorado; Alberta.
TYPE LOCALITY: Sweden, on *Juniperus* [*communis*].
DISTRIBUTION: Rocky Mountains from Alberta and British Columbia south to Colorado; also in Europe.
ILLUSTRATIONS: Beitr. Krypt. Schweiz 2^2: *f. 277*; Hedwigia **34**: 3, *f. 1*; Bot. Gaz. **49**: *pl. 21, f. 8*; E. & P. Nat. Pfl. 1^{1**}: *f. 33, C, D, E*; Forstl.-nat. Zeits. **4**: 384, *f. 1–3, 14–17*; Bull. N. Y. Bot. Gard. **7**: 457, *f. 20*; *pl. 155, f. 49*.

19. **Gymnosporangium gracilens** (Peck) Kern & Bethel; Kern, Bull. N. Y. Bot. Gard. **7**: 458. 1911.

Aecidium gracilens Peck, Bot. Gaz. **4**: 128. 1879.
Gymnosporangium speciosum Peck, Bot. Gaz. **4**: 217. 1879.
Aecidium Rusbyi W. Gerard, Bull. Torrey Club **8**: 34. 1881.
Tremella speciosa Arth. Proc. Ind. Acad. Sci. **1900**: 135. 1901.

O. Pycnia epiphyllous, rather sparsely arranged in irregular groups 1–3 mm. across, on discolored areas, honey-yellow becoming brownish, globoid, 145–150 μ in diameter; ostiolar filaments not prominent.

I. Aecia hypophyllous, in small groups 2–5 mm. across, on discolored spots, cylindrical, 0.3–0.4 mm. in diameter by 2–3 mm. high; peridium dehiscent at apex, retaining tubular form, margin rather deeply lacerate; peridial cells seen in both face and side views, rhomboidal or linear-rhomboidal in side view, 31–39 by 71–98 μ, broadly lanceolate in face view, 23–32 μ broad, moderately and densely verrucose over the entire surface with high slender, and somewhat irregular papillae, the outer wall 3–4 μ thick, the inner wall 10–15 μ thick;

aeciospores subgloboid, 21–24 by 24–29 μ; wall pale-yellow, 2.5–3.5 μ thick, finely verrucose, the pores numerous, scattered.

ON HYDRANGEACEAE:
Fendlera rupicola Engelm. & Gray, New Mexico.
Fendlera Wrightii Heller, Arizona.
Philadelphus ellipticus Rydb., New Mexico.
Philadelphus microphyllus A. Gray, Colorado.
Philadelphus occidentalis A. Nels., Colorado.

III. Telia caulicolous, from a perennial mycelium, appearing on long fusiform swellings, arranged in more or less evident longitudinal rows, cristiform, laterally compressed, irregularly crenate above, 2–7 mm. long by 1–1.5 mm. broad, 3–4 mm. high, sometimes confluent, orange-yellow; teliospores 2- or 3-celled, ellipsoid or oblong, 20–26 by 50–80 μ, rounded above and below, slightly constricted at the septa; wall pale-yellow, thin, about 1 μ, the pores 2 in each cell, near the septa; pedicels cylindrical, 7–10 μ in diameter, very long.

ON JUNIPERACEAE:
Juniperus monosperma (Engelm.) Sarg. (*J. occidentalis monosperma* Engelm., *Sabina monosperma* Rydb.), Colorado, New Mexico.
Juniperus pachyphlaea Torr. (*Sabina pachyphlaea* Ant.), Arizona, New Mexico.
Juniperus utahensis (Engelm.) Lemm. (*J. californica utahensis* Engelm., *Sabina utahensis* Rydb.), Colorado, Utah.
TYPE LOCALITY: Colorado, on *Philadelphus microphyllus*.
DISTRIBUTION: Colorado southwest into New Mexico and Arizona.
ILLUSTRATIONS: Bull. N. Y. Bot. Gard. **7**: 459, *f. 21*; *pl. 159*, *f. 61*.

20. **Gymnosporangium effusum** Kern, Bull. N. Y. Bot. Gard. **7**: 459. 1911.

O and I. Pycnia and aecia uncertain.

ON MALACEAE:
Aronia sp., proven by culture as to host, but without maturing aecia. It is possible that no. 22 may belong here.

III. Telia caulicolous, from a perennial mycelium, usually appearing on branches 0.3–1.5 cm. in diameter, causing long slender fusiform enlargements 0.5–2.5 by 15–40 cm., extending into and causing some swelling of the smaller branches and twigs arising from the infected areas, sometimes on the larger trunks, usually breaking forth in series along the branch with the grain of the wood, unevenly disposed, hypertrophied scars of previous seasons frequently interspersed, when dry more or less wedge-shaped, but often irregular and lacunose, sometimes forked or divided and staghorn-like, when mature and expanded 2–3 mm. broad by 2–5 mm. long at base, 7–10 mm. high, the surface more or less rugose, dark chestnut-brown becoming cinnamon-brown after expansion; teliospores 2-celled, oblong-ellipsoid, 16–22 by 45–55 μ, rounded or slightly narrowed both above and below, slightly constricted at the septum; wall dark cinnamon-brown, rather thin, 1–2 μ, varying in thickness on different spores, the pores 1 or 2 in each cell, near the septum; pedicel hyaline, cylindrical, uniform, 3–5 μ in diameter, very long.

ON JUNIPERACEAE:
Juniperus virginiana L., District of Columbia, New Jersey, New York, South Carolina.
TYPE LOCALITY: Santee Canal, South Carolina, on *Juniperus virginiana*.
DISTRIBUTION: Along the Atlantic coast from New York south to South Carolina.
ILLUSTRATION: Bull. N. Y. Bot. Gard. 7: *pl. 159*, *f. 60*.

21. **Gymnosporangium japonicum** Sydow, Hedwigia Beibl. **38**: 141. 1899.

Roestelia koreaensis P. Henn. in Warb. Monsunia 1: 5. 1900.
Tremella koreaensis Arth. Proc. Ind. Acad. Sci. **1900**: 136. 1901.

O. Pycnia epiphyllous, gregarious, numerous, crowded in roundish groups 1–3 mm. across, on discolored areas, prominent, punctiform, honey-yellow becoming blackish with age.

I. Aecia hypophyllous, in crowded or somewhat annular groups, on thickened discolored spots, cylindrical, 0.4–0.5 mm. in diameter by 2–3 mm. high; peridium soon becoming irregularly lacerate and cancellate often to base, erect or slightly spreading; peridial cells seen in both face and side views, broadly lanceolate or oval in face view, 29–32 by 64–90 μ, oblong in side view, 23–32 μ thick, coarsely rugose on inner and side walls, the ridges

becoming much higher on side walls and extending clear across, the outer wall 1.5–2 μ thick, the inner and side walls 5–7 μ; aeciospores globoid, 18–21 by 19–23 μ; wall pale cinnamon-brown, 1.5–2 μ thick, very finely verrucose.

ON MALACEAE:
Pyrus sp., Korea (cultivated on *Pyrus sinensis* Lindl.); not recorded for America.

III. Telia caulicolous, from a perennial mycelium, appearing on gradual fusiform enlargements, scattered, irregularly wedge-shaped, often incised at apex and lacunose below, 3–5 mm. high, cinnamon-brown; teliospores 2-celled, ellipsoid, 18–22 by 57–66 μ, not or very slightly constricted, usually narrowed above and below; wall pale cinnamon-brown, rather thin, 1–1.5 μ, the pores 2 in each cell, near the septum; pedicel uniform, 4–6 μ in diameter, very long.

ON JUNIPERACEAE:
Juniperus chinensis L., Connecticut.
TYPE LOCALITY: Tokyo, Japan, on *Juniperus chinensis*.
DISTRIBUTION: Found in Connecticut on plants imported from Japan; also in Japan and Korea.
ILLUSTRATIONS: Zeits. Pflanzenkr. **10**: *pl. 1–2;* Bull. N. Y. Bot. Gard. **7**: 460, *f. 22*.

22. **Gymnosporangium transformans** (Ellis) Kern, Bull. N. Y. Bot. Gard. **7**: 463. 1911.

Roestelia transformans Ellis; Peck, Bull. Torrey Club 5: 3. 1874.
Aecidium transformans Paz.; Rab.-Paz. Fungi Eur. *4238*. 1901.

O. Pycnia chiefly epiphyllous and fructicolous, gregarious, rather crowded, in small groups 0.5–1 mm. across, on discolored spots 2–7 mm. across, noticeable, honey-yellow becoming brownish, globoid, rather large, 144–170 μ in diameter by 112–150 μ high; ostiolar filaments 60–75 μ long.

I. Aecia hypophyllous, caulicolous, and fructicolous, occasionally solitary, usually gregarious, sometimes few together but more often aggregate in large groups, borne in gall-like, frustum-shaped protuberances (1–2 mm. high) of a reddish-brown color and more or less consolidated at the bases in the groups, at first cylindrical, 2–2.5 mm. high by 0.2–0.4 mm. in diameter; peridium soon becoming finely fimbriate to base, partially dropping away, the remainder spreading and twisted; peridial cells usually seen only in side view, very long and narrow, hygroscopic, becoming curved or even coiled when wet, 12–18 μ thick by 150–300 μ long, or more, in the sides of the peridium, much shorter toward the apex, the outer wall rather thin, 2–3 μ, smooth, the inner wall 4–6 μ thick, rather coarsely verrucose, the side walls verrucose on inner half with roundish or somewhat irregular papillae, more thickly crowded toward the inner side, the outer half of the side walls smooth; aeciospores globose, small, 18–22 μ in diameter; wall light cinnamon-brown, 1.5–2.5 μ thick, rather finely verrucose, the pores 6–8, scattered.

ON MALACEAE:
Aronia arbutifolia (L. f.) Ell. (*Pyrus arbutifolia* L. f.), Massachusetts, New Jersey.

III. Telia unknown.

TYPE LOCALITY: Newfield, New Jersey, on *Pyrus arbutifolia*.
DISTRIBUTION: Small area along the Atlantic coast from Massachusetts to New Jersey.
ILLUSTRATIONS: Bot. Gaz. **49**: *pl. 21, f. 7;* Bull. N. Y. Bot. Gard. **7**: 463, *f. 25*.
EXSICCATI: Ellis, N. Am. Fungi *1088;* Seym. & Earle, Econ. Fungi *247, 247a;* Roum. Fungi Sel. *4533;* Thüm. Myc. Univ. *1029;* Rab.-Paz. Fungi Eur. *4238*.

23. **Gymnosporangium clavariaeforme** (Jacq.) DC. Fl. Fr. 2: 217. 1805.

Tremella clavariaeformis Jacq. Coll. **2**: 174. 1788.
Tremella ligularis Bull. Herb. Fr. *pl. 427*. 1788.
Tremella digitata Vill. Hist. Pl. Dauph. 3: 1007. 1789.
Aecidium laceratum Sow. Engl. Fungi *pl. 318*. 1801.
Aecidium Oxyacanthae Pers. Syn. Fung. 206. 1801.
Cyglides laceratum Chev. Fl. Paris 1: 384. 1826.
Podisoma ligulatum Chev. Fl. Paris 1: 423. 1826.
Tremella juniperina Wahl. Fl. Suec. 994. 1826.
Podisoma clavariaeforme Duby, Bot. Gall. **2**: 881. 1830.
Podisoma Juniperi-communis Fries, Syst. Myc. 3: 508. 1832.

Roestelia lacerata Fries, Summa Veg. Scand. 510. 1849.
Roestelia carpophila Bagnis, Erb. Critt. Ital. II. *732*. 1878.
Roestelia lacerata x, Thaxter, Proc. Am. Acad. **22**: 266. 1887.
Puccinia penicillata Kuntze, Rev. Gen. **3**^{3}: 508. 1898.
Gymnosporangium gracile Pat. Bull. Soc. Myc. Fr. **18**: 46. 1902.
Gymnosporangium Oxycedri Bres. Broteria **2**: 88. 1903.
Aecidium clavariaeforme Arth. Résult. Sci. Congr. Bot. Vienne 343. 1906.

O. Pycnia chiefly epiphyllous and fructicolous, gregarious, more or less crowded in roundish groups 1–2 mm. across, on discolored spots 1.5–3 mm. across, punctiform, prominent, honey-yellow becoming dark-brown, regularly conical, 130–155 μ in diameter by 65–100 μ high; ostiolar filaments 50–75 μ long.

I. Aecia hypophyllous, fructicolous, and caulicolous, gregarious, on slightly discolored hypertrophied areas, usually crowded in small groups on the leaf-blades, about 2–3 mm. across, sometimes in somewhat larger groups on the veins, petioles, and twigs, often densely aggregated on the fruits occupying part or all of the surface, cylindrical, 0.7–1.5 mm. high by 0.3–0.5 mm. in diameter; peridium soon becoming lacerate, usually to base, erect or spreading; peridial cells seen in both face and side views, long and narrow, somewhat hygroscopic, often becoming somewhat curved when wet, linear in face view, 18–30 by 80–130 μ, linear or linear-oblong in side view, 15–25 μ thick and usually slightly curved, the outer wall rather thin, 1–2 μ, smooth, the inner and side walls thick, 5–7 μ, rather coarsely verrucose with roundish or somewhat irregular papillae of varying sizes rather closely set; aeciospores globoid, 20–27 by 25–30 μ; the wall light cinnamon-brown, rather thick, 2.5–3.5 μ, moderately verrucose, the pores evident, 8–10, scattered.

ON MALACEAE:
Amelanchier alnifolia Nutt., Colorado, Nebraska.
Amelanchier canadensis (L.) Medic. (*Amelanchier Botryapium* DC.), Connecticut, Delaware, Massachusetts, New Hampshire, Vermont.
Amelanchier intermedia Spach (*A. Botryapium* Hook., not DC.), Massachusetts, New Hampshire, Wisconsin.
Amelanchier oblongifolia (T. & G.) Roem., Michigan.
Amelanchier oreophila A. Nels., Colorado.
Amelanchier polycarpa Greene, Colorado, Wyoming.
Amelanchier pumila Nutt., Wyoming.
Aronia arbutifolia (L.) Medic. (*Pyrus arbutifolia* L.), Massachusetts.
Cydonia vulgaris (L.) Pers., Connecticut, Maine.

III. Telia caulicolous, from a perennial mycelium, appearing on long fusiform swellings of various sized branches, numerous, scattered or sometimes aggregated, cylindrical or slightly compressed, 5–10 mm. long by 0.8–1.5 mm. in diameter, acute or sometimes forked at the apex, brownish-yellow becoming yellowish and pulverulent by germination; teliospores 2-celled, lanceolate, 13–20 by 50–80 μ, occasionally longer, rounded or narrowed above, usually narrowed below, very slightly or not at all constricted at the septum; wall golden-yellow, thin, about 1 μ, the pores 2 in each cell, near the septum; pedicel cylindrical, uniform, 3–4 μ in diameter, very long.

ON JUNIPERACEAE:
Juniperus communis L., Connecticut, Illinois, Iowa, Maine, Massachusetts, Minnesota, New Hampshire, New York.
Juniperus sibirica Burgsd. (*J. nana* Willd.), Colorado, Illinois, Michigan.
TYPE LOCALITY: Carinthia, on *Juniperus communis*.
DISTRIBUTION: Maine and Delaware west to Wisconsin and northeastern Iowa, and in northwestern Nebraska, Wyoming, and Colorado; also in Europe.
ILLUSTRATIONS: Beitr. Krypt. Schweiz **2**^{2}: *f. 275*; Hedwigia **34**: *3, f. 3*; Grev. Scot. Crypt. Fl. *pl. 209*; Bot. Gaz. **49**: *pl. 21, f. 6*; Bull. N. Y. Bot. Gard. **7**: 465, *f. 26*; *pl. 158*.
EXSICCATI: Seym. & Earle, Econ. Fungi *241, 242a, b, c*; Ellis, N. Am. Fungi *273*; Ellis & Ev. Fungi Columb. *56*.

24. **Gymnosporangium Ellisii** (Berk.) Farl.; Ellis, N. Am. Fungi *271*. 1879.

Podisoma Ellisii Berk. Grevillea **3**: 56. 1874.
Hamaspora Ellisii Körn. Hedwigia **16**: 23. 1877.
Phragmidium Ellisii De-Toni, in Sacc. Syll. Fung. **7**: 750. 1888.
Tremella Ellisii Arth. Proc. Ind. Acad. Sci. **1900**: 135. 1901.

O and I. Pycnia and aecia unknown.

III. Telia caulicolous, from a perennial mycelium which distorts the younger branches causing slight enlargements and usually dense fasciations, numerous, thickly scattered,

often over considerable areas, cylindrical, filiform, rather long, 3–6 mm., about 0.5–1 mm. in diameter, orange-colored; teliospores 2–5-celled, linear-fusiform, 9–16 by 85–170 μ, not constricted at the septa; wall pale-yellow, thin, about 1 μ, the pores apical, 1 in the uppermost cell, 2 in each of the other cells; pedicel cylindrical, uniform, slender, very long.

ON JUNIPERACEAE:
Chamaecyparis thyoides (L.) B.S.P. (*Cupressus thyoides* L., *Chamaecyparis sphaeroidea* Spach), Alabama, Delaware, Florida, Massachusetts, New Jersey.
TYPE LOCALITY: Newfield, New Jersey, on living white cedar [*Chamaecyparis thyoides*].
DISTRIBUTION: Along the Atlantic coast from Massachusetts to Delaware, and in northern Florida and southern Alabama.
ILLUSTRATIONS: Farl. Gymnosp. U. S. *pl. 2, f. 13–17*; Bull. N. Y. Bot. Gard. 7: 466, *f. 28*.
EXSICCATI: Rab.-Wint. Fungi Eur. *2920*; Thüm. Myc. Univ. *1936*; Roum. Fungi Sel. *4921*; Seym. & Earle, Econ. Fungi *246*; Ellis, N. Am. Fungi *271*; Ellis & Ev. Fungi Columb. *55*.

25. **Gymnosporangium Betheli** Kern, Bull. Torrey Club 34: 459. 1907.

Roestelia Betheli Kern, Bull. Torrey Club 34: 461. 1907.

O. Pycnia fructicolous and epiphyllous, numerous, gregarious, more or less crowded in irregular groups on discolored spots, punctiform, subepidermal, honey-yellow becoming blackish, flask-shaped, 130–160 μ in diameter by 100–112 μ high; ostiolar filaments 45–65 μ long.

I. Aecia fructicolous and hypophyllous, densely aggregate on discolored spots, usually occupying only part of the surface on the fruits, or in small groups on the leaf-blades, cylindrical, 0.2–0.3 mm. in diameter, 3–8 mm. high; peridium soon becoming finely lacerate above, often nearly to base, spreading; peridial cells seen in both face and side views, rather long and narrow, hygroscopic, curving somewhat when wet, broadly lanceolate in face view, 20–25 by 60–90 μ, linear and slightly curved in side view, 13–20 μ thick, the outer wall thin, 1–1.5 μ, smooth, the inner and side walls moderately thick, 4–6 μ, moderately rugose with closely set linear ridges with a few separate elongate papillae interspersed; aeciospores globoid, 18–24 by 23–30 μ; wall chestnut-brown, 2.5–3 μ thick, finely verrucose, the pores several, scattered.

ON MALACEAE:
Crataegus coloradensis A. Nelson, Colorado.
Crataegus chrysocarpa Ashe, Colorado, Montana, Wyoming.
Crataegus Douglasii Lindl. (*C. brevispina* Dougl.), Montana, Oregon, Washington.
Crataegus erythropoda Ashe (*C. Cerronis* A. Nels.), Colorado.
Crataegus occidentalis Britton, Colorado.
Crataegus rivularis Nutt., Colorado.
Crataegus saligna Greene, Colorado.

III. Telia caulicolous, from a perennial mycelium, appearing on irregular, elongate, gall-like knots, usually breaking forth in succession along the branch with the grain of the wood, varying greatly in size and extent, unevenly disposed, wedge-shaped, 1–1.5 mm. broad by 1–3 mm. long at the base, 3–4 mm. high, chestnut-brown; teliospores 2-celled, ellipsoid, 17–25 by 40–55 μ, rounded or somewhat narrowed above and below, slightly or not constricted at the septum; wall dark cinnamon-brown, varying in thickness on different spores, 1–2 μ, smooth, the pores 2 in each cell, near the septum; pedicel hyaline, cylindrical, uniform, 6–7 μ in diameter, very long.

ON JUNIPERACEAE:
Juniperus scopulorum Sarg. (*Sabina scopulorum* Rydb.), Colorado.
TYPE LOCALITY: Boulder, Colorado, on *Sabina scopulorum*.
DISTRIBUTION: Northeastern Washington and southeastern Oregon to Colorado.
ILLUSTRATIONS: Bot. Gaz. 49: *pl. 21, f. 5*; Bull. N. Y. Bot. Gard. 7: 467, *f. 29*; *pl. 159, f. 59*.
EXSICCATI: Barth. Fungi Columb. *2526, 2788, 2789, 2790*; D. Griff. W. Am. Fungi *333*; Ellis & Ev. Fungi Columb. *1480*.

26. **Gymnosporangium globosum** Farl. Gymnosp. U. S. 34. 1880.

Gymnosporangium fuscum globosum Farl. Gymnosp. U. S. 18. 1880.
Roestelia lacerata y, z, Thaxter, Proc. Am. Acad. 22: 266. 1887.
Puccinia globosa Kuntze, Rev. Gen. 3^3: 507. 1898.
Tremella globosa Arth. Proc. Ind. Acad. Sci. 1900: 136. 1901.
Aecidium globosum Farl. Bibl. Index 1: 49. 1905.

O. Pycnia epiphyllous, numerous, gregarious, more or less crowded in irregular groups 1–3 mm. across, on discolored spots 3–7 mm. across, prominent, conspicuous, honey-yellow

becoming blackish, slightly flattened, globose, 150–190 μ in diameter by 115–175 μ high; ostiolar filaments 65–80 μ long.

I. Aecia chiefly hypophyllous, crowded in irregular, or rarely annular groups 2–7 mm. across, on thickened, discolored spots 3–12 mm. across, cylindrical, 1.5–3 mm. high by 0.1–0.2 mm. in diameter; peridium soon splitting in the upper part, becoming reticulose half way to the base, the margin finely lacerate or fimbriate, erect; peridial cells seen in both face and side views, not hygroscopic, remaining straight when wet, broadly lanceolate in face view, 15–23 by 60–90 μ, linear-rhomboidal in side view, 13–19 μ thick, the outer wall rather thin, about 1.5 μ, smooth, the inner and side walls moderately thick, 3–5 μ, rather densely rugose with ridges of varying length; aeciospores globoid or broadly ellipsoid, 15–19 by 18–25 μ; wall light chestnut-brown, 1.5–2 μ thick, finely verrucose, the pores distinct, 6–8, scattered.

ON MALACEAE:

Crataegus acutiloba Sarg., New York, Vermont.
Crataegus ancisa Beadle, Alabama.
Crataegus anomala Sarg., Connecticut.
Crataegus apposita Bissellii Eggl., Connecticut.
Crataegus arcuata Ashe, Pennsylvania.
Crataegus asperifolia Sarg., Vermont.
Crataegus biltmoreana Beadle, Missouri.
Crataegus Boyntoni Beadle, North Carolina.
Crataegus Brainerdi Sarg., Vermont.
Crataegus Buckleyi Beadle, North Carolina,
Crataegus champlainensis Sarg., New York.
Crataegus Chapmani Ashe, North Carolina.
Crataegus coccinea L. (*C. modesta* Sarg.), Connecticut, Illinois, Indiana, Massachusetts, New York, Vermont.
Crataegus coccinioides Ashe, Missouri.
Crataegus coccinioides dilatata (Sarg.) Eggl., Massachusetts, New York, Vermont.
Crataegus collina Chapm., Georgia, Virginia.
Crataegus colorata Sarg., Ontario.
Crataegus conjuncta Sarg., Connecticut, Massachusetts.
Crataegus conspicua Sarg., Vermont.
Crataegus consueta Sarg., Missouri.
Crataegus corusca Sarg., Illinois.
Crataegus Crus-galli L., Kentucky, Massachusetts, Missouri, North Carolina, Tennessee, Virginia.
Crataegus cyclophylla Sarg., Vermont.
Crataegus decorata Sarg., Missouri.
Crataegus delecta Sarg., Illinois.
Crataegus delectabilis Sarg., Ontario.
Crataegus delucida Sarg., Vermont.
Crataegus demissa Sarg., Massachusetts, Vermont.
Crataegus disjuncta Sarg., Missouri.
Crataegus dispar Beadle, South Carolina.
Crataegus dispessa Ashe (*C. pyriformis* Britton), Missouri.
Crataegus dissimilis Sarg., Connecticut.
Crataegus dissona Sarg., Massachusetts, New Hampshire, New York.
Crataegus dumetosa Sarg., Missouri.
Crataegus Eamesi Sarg., Connecticut.
Crataegus Edsoni Sarg., New Hampshire, Vermont.
Crataegus Egglestoni Sarg., New York, Vermont.
Crataegus Engelmanni Sarg., Missouri.
Crataegus festiva Sarg., Connecticut.
Crataegus Forbesae Sarg., Connecticut.
Crataegus fretalis Sarg., Connecticut.
Crataegus genialis Sarg., Vermont.
Crataegus glaucophylla Sarg., Connecticut, New York.
Crataegus Harbisoni Beadle, Tennessee.
Crataegus Holmesiana Ashe (*C. tenuifolia* Britton), Connecticut, New York, Vermont.
Crataegus lasiantha Sarg., Missouri.
Crataegus macilenta Beadle, Alabama.
Crataegus macracantha Lodd., Connecticut, New York, South Dakota, West Virginia, Wisconsin.
Crataegus macracantha succulenta (Schrad.) Eggl., Wisconsin.
Crataegus Margaretta Ashe, Iowa, Missouri.
Crataegus McGeeae Ashe, Iowa.
Crataegus membranacea Sarg., Vermont.
Crataegus Mohri Beadle, Georgia.
Crataegus mollis (T. & G.) Scheele, Illinois, Indiana, Iowa, Kansas, Kentucky, Massachusetts, Missouri, Nebraska, Ohio.
Crataegus neo-londinensis Sarg., Connecticut.
Crataegus Peckiella Sarg., New York.

Crataegus pentandra Sarg., Vermont.
Crataegus Pequotorum Sarg., Connecticut.
Crataegus pertomentosa Ashe, Iowa, Kansas.
Crataegus Phaenopyrum (L. f.) Medic. (*C. cordata* Ait.), Delaware, Tennessee.
Crataegus pinguis Sarg., Michigan.
Crataegus pisifera Sarg., Vermont.
Crataegus polita Tatnalliana (Sarg.) Eggl., Missouri.
Crataegus praecox Sarg., New York.
Crataegus Pringlei Sarg., Connecticut, Indiana, New York.
Crataegus pruinosa (Wendl.) C. Koch, Connecticut, Missouri, New York, Ohio, South Carolina.
Crataegus pruinosa latisepala (Ashe) Eggl. (*C. cognata* Sarg., *C. latisepala* Ashe), Massachusetts, Michigan.
Crataegus punctata Jacq., Indiana, Illinois, Iowa, Massachusetts, Michigan, Missouri, New York, North Carolina, Ohio, Pennsylvania, Vermont, West Virginia; Ontario.
Crataegus quinebaugensis Sarg., Connecticut.
Crataegus Reverchoni Sarg., Texas.
Crataegus rhombifolia Sarg., Connecticut, Massachusetts, New York, Vermont.
Crataegus roanensis Ashe (*C. ascendens* Sarg.), Kentucky, Vermont.
Crataegus Robbinsiana Sarg., Vermont.
Crataegus rotundifolia Moench, Iowa, Vermont; Ontario.
Crataegus scabrida Sarg., Vermont.
Crataegus Schweinitziana Sarg., Pennsylvania.
Crataegus submollis Sarg., Vermont.
Crataegus sucida Sarg., Missouri.
Crataegus tecta Beadle, Alabama.
Crataegus tenella Ashe, Connecticut.
Crataegus tetrica Beadle, Tennessee.
Crataegus tomentosa L., Illinois, Maine, Missouri, New York, Ohio, Wisconsin; Ontario, Quebec.
Crataegus Treleasei Sarg., Missouri.
Malus Malus (L.) Britton, Connecticut, Maine, Massachusetts, New York, Vermont.
Pyrus communis L., Connecticut, New York.
Sorbus americana Marsh., Massachusetts, Vermont.

III. Telia caulicolous, from a perennial mycelium, appearing on irregular globoid gall-like excrescences 3–25 mm. in diameter, unevenly disposed, sometimes densely aggregate, often separated by the scars of the sori of previous seasons, tongue- or wedge-shaped, becoming about 1.5–3 mm. broad by 2–5 mm. long at the base by 6–12 mm. high when fully mature, chestnut-brown becoming yellowish and pulverulent by germination; teliospores 2-celled, ellipsoid, 16–21 by 37–48 μ, somewhat narrowed above and below, slightly constricted at the septum; wall pale cinnamon-brown, uniformly thin, 1–2 μ, the pores 2 in each cell, near the septum; pedicel cylindrical, uniform, 4–7 μ in diameter, very long.

ON JUNIPERACEAE:
Juniperus barbadensis L. (*Sabina barbadensis* Small), Alabama.
Juniperus virginiana L. (*Sabina virginiana* Ant.), Alabama, Connecticut, Illinois, Indiana, Iowa, Kansas, Kentucky, Louisiana, Massachusetts, Michigan, Mississippi, Missouri, New York, North Carolina, South Carolina, Texas, West Virginia, Vermont, Wisconsin; Ontario.

TYPE LOCALITY: Massachusetts, on *Juniperus virginiana*.

DISTRIBUTION: Maine west to southeastern South Dakota and south to northern Florida and Texas.

ILLUSTRATIONS: Farl. Gymnosp. U. S. *pl. 1, f. 7–11;* Bull. Iowa Exp. Sta. 84: *f. 3;* E. & P. Nat. Pfl. 1[1]**: *f. 34, A;* Hedwigia 34: 3, *f. 6;* Bot. Gaz. 49: *pl. 21, f. 4;* Bull. N. Y. Bot. Gard. 7: 468, *f. 30; pl. 161, f. 67.*

EXSICCATI: Ellis, N. Am. Fungi *1478;* Ellis & Ev. N. Am. Fungi *2997, 2998;* Ellis & Ev. Fungi Columb. *758, 2028;* Barth. Fungi Columb. *3434;* Thüm. Myc. Univ. *2139;* Sydow, Ured. *296, 1434, 2048;* Rab.-Wint.-Paz. Fungi Eur. *4013;* Seym. & Earle, Econ. Fungi *229x* (in part), *y* (in part), *231b, 233a, 237* (in part); Kellerm. Ohio Fungi *44;* Rav. Fungi Am. *481;* Shear, N. Y. Fungi *79, 123.*

27. **Gymnosporangium hyalinum** (Cooke) Kern, Bull. N. Y. Bot. Gard. 7: 470. 1911.

Roestelia hyalina Cooke, Bull. Soc. Bot. Fr. 24: 315. 1877.
Aecidium hyalinum Farl. Bibl. Index 1: 55. 1905.

O. Pycnia epiphyllous, rather few, gregarious, on discolored spots, noticeable, honey-yellow becoming brownish.

I. Aecia hypophyllous, rather numerous, gregarious, borne in small gall-like pyriform protuberances of a reddish-brown color which are consolidated at the bases, cylindrical, 2–5 mm. high by 0.2–0.3 mm. in diameter; peridium tardily rupturing with a few irregular slits along the sides, somewhat twisted but not spreading or recurved; peridial cells usually seen

only in face view, lanceolate, 19–29 by 87–105 μ, usually obtuse below and considerably narrowed above, not hygroscopic, remaining straight when wet, the walls smooth on all surfaces, the inner and side walls 3–4 μ thick, the outer wall 12–16 μ thick; aeciospores globoid, 19–26 μ in diameter; wall light cinnamon-brown, 2–3 μ thick, very moderately verrucose, the pores 6–8, scattered.

ON MALACEAE:
Crataegus clara Beadle, Florida.
Crataegus dispar Beadle, South Carolina.
Crataegus egens Beadle, Florida.
Crataegus egregia Beadle, Florida.
Crataegus Michauxii Pers., South Carolina.
Crataegus munda Beadle, North Carolina.
Crataegus pexa Beadle, North Carolina.
Crataegus quasita Beadle, Florida.
Crataegus viridis L., South Carolina.
Crataegus visenda Beadle, Florida.

III. Telia unknown.

TYPE LOCALITY: South Carolina, on *Crataegus* sp.
DISTRIBUTION: Atlantic coast from North Carolina south to northern Florida.
ILLUSTRATIONS: Bot. Gaz. **49**: *pl. 22, f. 11;* Bull. N. Y. Bot. Gard. **7**: 470, *f. 31.*
EXSICCATI: Rav. Fungi Am. *37.*

28. **Gymnosporangium Nelsoni** Arth. Bull. Torrey Club **28**: 665. 1901.

Roestelia Nelsoni Arth. Bull. Torrey Club **28**: 665. 1901.
Aecidium Nelsoni Farl. Bibl. Index **1**: 68. 1905.
Gymnosporangium durum Kern, Bull. Torrey Club **34**: 460. 1907.

O. Pycnia epiphyllous, gregarious, in small groups 0.5–1 mm. across, on discolored spots, punctiform, rather prominent, orange-yellow becoming blackish, 128–144 μ in diameter by 100–112 μ high; ostiolar filaments 35–80 μ long.

I. Aecia hypophyllous and fructicolous, usually in small groups 1–2 mm. across, cylindrical, 2–4 mm. high by 0.2–0.3 mm. in diameter; peridium whitish, dehiscent at apex and also rupturing more or less along the sides; peridial cells seen in both face and side views, broadly lanceolate in face view, 18–35 by 75–115 μ, linear-rhomboidal in side view, 16–35 μ thick, the outer wall rather thin, 1.5–2 μ, smooth, the inner and side walls 7–12 μ thick, evenly and densely verrucose; aeciospores globoid, 19–26 by 21–29 μ; wall chestnut-brown, 2–3 μ thick, finely verrucose, the pores 6-10, scattered.

ON MALACEAE:
Amelanchier alnifolia Nutt., Colorado, Utah, Wyoming.
Amelanchier elliptica A. Nels., Colorado.
Amelanchier oreophila A. Nels., Colorado, Wyoming.
Amelanchier polycarpa Greene, Wyoming.
Amelanchier pumila Nutt., Montana.
Cydonia vulgaris (L.) Pers., Colorado.
Peraphyllum ramosissimum Nutt., Colorado.
Pyrus communis L., Colorado.
Sorbus occidentalis (S. Wats.) Greene, Montana.

III. Telia caulicolous, from a perennial mycelium, appearing on firm, woody, regularly globose galls 0.5–5 cm. in diameter, unevenly disposed, densely aggregated or often separated by the scars of the sori of previous seasons, irregularly flattened, about 1–1.5 mm. broad by 1–5 mm. long at the base, 3.5 mm. high, often confluent, light chestnut-brown; teliospores 2-celled, narrowly ellipsoid, 18–22 by 50–65 μ, narrowed at both ends, slightly constricted at the septum; wall pale cinnamon-brown, 1–1.5 μ thick, the pores 2 in each cell, near the septum; pedicel hyaline, cylindrical, uniform, 4–6 μ in diameter, very long.

ON JUNIPERACEAE:
Juniperus monosperma (Engelm.) Sarg. (*Sabina monosperma* Rydb.), Colorado, Wyoming.
Juniperus scopulorum Sarg. (*Sabina scopulorum* Rydb.), Colorado, Montana, Utah, Wyoming; Alberta.
Juniperus utahensis (Engelm.) Lemm. (*J. californica utahensis* Engelm., *Sabina utahensis* Rydb.), Arizona, Colorado.
TYPE LOCALITY: Laramie Hills, Wyoming, on *Juniperus scopulorum.*
DISTRIBUTION: Alberta south to Colorado and Arizona.
ILLUSTRATIONS: Bot. Gaz. **49**: *pl. 22, f. 13;* Bull. N. Y. Bot. Gard. **7**: 471, *f. 32; pl. 161, f. 68.*
EXSICCATI: Ellis & Ev. Fungi Columb. *1676;* Garrett, Fungi Utah. *177.*

29. **Gymnosporangium corniculans** Kern; Arth. Mycologia **2**: 236. 1910.

O. Pycnia epiphyllous, rather few, gregarious, in small groups 0.5–1 mm. across, on discolored spots, rather prominent and conspicuous, honey-yellow becoming blackish, slightly flattened-globose, 130–175 μ in diameter by 130–160 μ high; ostiolar filaments 50–80 μ long.

I. Aecia hypophyllous, gregarious, crowded in irregular or sometimes annular groups 2–5 mm. across, on discolored hypertrophied spots, cylindrical or horn-shaped, acutish at apex, 2–3.5 mm. high, 0.3–0.5 mm. in diameter; peridium not or only rarely rupturing at apex, very tardily dehiscent by longitudinal slits along the sides; peridial cells usually seen in face view, not hygroscopic, remaining straight when wet, broadly lanceolate, 16–23 by 64–96 μ, rhomboidal in side view, 18-25 μ thick, the outer wall rather thin, 1.5-2 μ, smooth, the inner and side walls rather thick, 5–7 μ, moderately verrucose with oval or roundish papillae and a few rather delicate elongate papillae interspersed, the papillae becoming shorter and more oval toward the outer wall; aeciospores globoid, 20–26 by 23–32 μ; wall dark cinnamon-brown, rather thick, 3–4 μ, very finely verrucose, appearing nearly smooth, the pores 8–10, scattered.

ON MALACEAE:
Amelanchier canadensis (L.) Medic. (*A. Botryapium* DC.), Illinois, Iowa, Massachusetts, Pennsylvania, Vermont, West Virginia.
Amelanchier erecta Blanchard, Michigan.
Amelanchier intermedia Spach (*A. Botryapium* Hook., not DC.), Illinois, New York.
Amelanchier oblongifolia (T. & G.) Roem., Michigan.
Amelanchier sanguinea (Pursh) Lindl. (*A. rotundifolia* Roem.), Ontario.

III. Telia caulicolous, from a perennial mycelium, appearing on irregularly lobed, gall-like excrescences 2–15 mm. or more in diameter, unevenly disposed, often separated by the scars of the sori of previous seasons, conical or cylindrical-acuminate, 1.5–2 mm. in diameter at the base by 3–5 mm. high, dark chestnut-brown becoming yellowish and pulverulent by germination; teliospores 2-celled, ellipsoid, 18–21 by 35–50 μ, usually rounded both above and below, slightly or not at all constricted at the septum, slightly enlarged near the septum in one or two places owing to the presence of hyaline thickenings over the germ-pores; wall light cinnamon-brown, thin, 1–1.5 μ, hyaline thickenings about 1–1.5 μ, the pores 1 or 2 in each cell, near the septum; pedicel uniform, 4–6 μ in diameter, rather long.

ON JUNIPERACEAE:
Juniperus horizontalis Moench (*J. prostrata* Pers.), Michigan.
Juniperus virginiana L., New York.
TYPE LOCALITY: Leland, Michigan, on *Juniperus horizontalis*.
DISTRIBUTION: From Vermont and Massachusetts west to northern Illinois and eastern Iowa.
ILLUSTRATIONS: Bull. N. Y. Bot. Gard. **7**: 472, *f. 33*; *pl. 160*, *f. 64*.
EXSICCATI: Ellis & Ev. N. Am. Fungi *2715;* Ellis & Ev. Fungi Columb. *1827;* Seym. & Earle, Econ. Fungi *248a*, *b*.

30. **Gymnosporangium floriforme** Thaxter; Kern, Bull. Torrey Club **35**: 503. 1908.

Roestelia flaviformis Atk.; Underw. & Earle, Bull. Ala. Exp. Sta. **80**: 218, hyponym. 1897.
Gymnosporangium flaviforme Earle, Contr. U. S. Nat. Herb. **6**: 186, hyponym. 1901.
Aecidium flaviforme Farl. Bibl. Index **1**: 44, hyponym. 1905.

O. Pycnia epiphyllous, numerous, gregarious, more or less crowded in irregular groups 1–5 mm. across, on thickened discolored spots 5-10 mm. or more across, prominent, conspicuous, punctiform, honey-yellow becoming blackish, globoid or somewhat flask-shaped, 150–175 μ in diameter, 130–160 μ high; ostiolar filaments up to 50 μ long.

I. Aecia hypophyllous, rather widely separated in oblong-annular groups 2–6 mm. across, on thickened discolored spots 5–10 mm. or more across, at first cylindrical, 1–1.5 mm. high, 0.2–0.5 mm. in diameter; peridium splitting extremely early and becoming rather finely fimbriate to the base, strongly revolute; peridial cells usually seen only in side view, long and narrow, 10–14 by 65–85 μ, hygroscopic, becoming somewhat curved when wet, the outer wall smooth, rather thin, 1.5–2 μ, the inner wall rugose, moderately thick, 4–5 μ, the side walls rather closely rugose with ridges running from the inner side transversely and

slightly downward, extending nearly across and becoming slightly broader, with a few solitary ridge-like papillae in the intervening spaces; aeciospores angular-ellipsoid, 18–23 by 23–29 μ; wall chestnut-brown, 1.5–2.5 μ thick, finely verrucose, the pores evident, 6–8, scattered.

ON MALACEAE:
Crataegus spathulata Michx., Alabama, Arkansas.

III. Telia foliicolous and caulicolous, from an annual or biennial mycelium, appearing on rather small, lobed, gall-like excrescences 3–10 mm. across or occasionally larger and globoid or subreniform, usually numerous, rather evenly disposed, about 1–3 mm. apart, sometimes few in a ray-like arrangement at right angles to the short axis of the gall, or occasionally singly on small galls, conical or cylindrical-acuminate, becoming 1–1.5 mm. broad at the base by 3–10 mm. long when fully mature, chestnut-brown becoming yellowish and pulverulent by germination; teliospores 2-celled, narrowly ellipsoid, 15–19 by 39–50 μ, rounded above and below, slightly or not constricted at the septum; wall pale cinnamon-brown, uniformly thin, 1–1.5 μ, the pores 2 in each cell, near the septum; pedicel hyaline, cylindrical, uniform, 3–6 μ in diameter, very long.

ON JUNIPERACEAE:
Juniperus virginiana L. (*Sabina virginiana* Ant.), Alabama, Florida, Mississippi, South Carolina, Texas.
TYPE LOCALITY: Auburn, Lee County, Alabama, on *Sabina virginiana*.
DISTRIBUTION: South Carolina and northern Florida westward to Arkansas and eastern Texas.
ILLUSTRATIONS: Bot. Gaz. **49**: *pl. 21, f. 3;* Bull. N. Y. Bot. Gard. **7**: 473, *f. 34.*
EXSICCATI: Sydow, Ured. *1194.*

31. **Gymnosporangium Juniperi-virginianae** Schw. Schr. Nat. Ges. Leipzig **1**: 74. 1822.

Gymnosporangium macropus Link, in Willd. Sp. Pl. 6^2: 128. 1825.
Gymnosporangium virginianum Spreng. Syst. Veg. **4**: 562. 1827.
Podisoma Juniperi-virginianae Fries, Syst. Myc. **3**: 507. 1832.
Caeoma (*Aecidium*) *pyratum* Schw. Trans. Am. Phil. Soc. II. **4**: 294. 1832.
Podisoma macropus Schw. Trans. Am. Phil. Soc. II. **4**: 307. 1832.
Aecidium pyratum Schw. Trans. Am. Phil. Soc. II. **4**: 309. 1832.
Roestelia penicillata Farl. Gymnosp. U. S. 30. 1880. Not *R. penicillata* Fries, 1849.
Roestelia pyrata Thaxter, Proc. Am. Acad. **22**: 269. 1887.
Puccinia macropus Kuntze, Rev. Gen. 3^3: 507. 1898.
Puccinia Juniperi-virginianae Arth. Proc. Ind. Acad. Sci. **1898**: 186. 1899.
Tremella Juniperi-virginianae Arth. Proc. Ind. Acad. Sci. **1900**: 135. 1901.
Aecidium Juniperi-virginianae Arth. Résult. Sci. Congr. Bot. Vienne 343. 1906.

O. Pycnia epiphyllous, numerous, gregarious, more or less crowded in irregular groups 1–5 mm. across, on discolored spots 5–15 mm. across, prominent, conspicuous, punctiform, honey-yellow becoming blackish, globoid, 110–125 μ in diameter by 110–130 μ high; ostiolar filaments 35–50 μ long.

I. Aecia chiefly hypophyllous, crowded in annular groups 1.5–10 mm. across, on thickened, discolored spots 5–15 mm. across, at first cylindrical, 1–2 mm. high, 0.1–0.4 mm. in diameter; peridium splitting extremely early and becoming very finely fimbriate to the base, strongly revolute; peridial cells usually seen only in side view, long and narrow, 10–16 by 65–100 μ, hygroscopic, becoming strongly curved when wet, the outer wall moderately thin, 2.5–3 μ, smooth, the inner wall coarsely rugose, moderately thick, 4–6 μ, the side walls rather sparsely rugose with ridges running from the inner side obliquely downward, extending about half way across or more and becoming gradually broader, with shorter ridge-like papillae in the intervening spaces; aeciospores globoid or broadly ellipsoid, 16–24 by 21–31 μ; wall light chestnut-brown, moderately thick, 2–3 μ, finely verrucose, the pores distinct, 8–10, scattered.

ON MALACEAE:
Malus angustifolia (Ait.) Michx. (*Pyrus angustifolia* Ait.), Alabama, Florida, Nebraska, North Carolina, South Carolina, Virginia.
Malus baccata (L.) Desf. (*Pyrus baccata* L.), Maryland.
Malus coronaria (L.) Mill. (*Pyrus coronaria* L.), Delaware, District of Columbia, Illinois, Indiana, Iowa, Kansas, Maryland, Massachusetts, North Carolina, Ohio, Pennsylvania, South Carolina, West Virginia, Wisconsin; Ontario.
Malus ioensis (Wood) Britton (*Pyrus coronaria ioensis* Wood, *Pyrus ioensis* Bailey), Alabama, Connecticut, Illinois, Indiana, Iowa, Kansas, Missouri, Nebraska, New York, Wisconsin.

Malus Malus (L.) Britton (*Pyrus Malus* L.), Alabama, Arkansas, Connecticut, Delaware, District of Columbia, Georgia, Illinois, Indiana, Iowa, Kentucky, Louisiana, Maryland, Massachusetts, Michigan, Mississippi, Nebraska, New Jersey, New York, North Carolina, Ohio, Pennsylvania, South Carolina, South Dakota, Tennessee, Vermont, Virginia, West Virginia, Wisconsin; Ontario.

III. Telia foliicolous, from an annual or biennial mycelium, appearing on globoid or reniform gall-like excrescences 5–30 mm. or more in diameter, rather evenly disposed, about 1.5–4 mm. apart, cylindrical or cylindrical-acuminate, becoming about 1.5–3 mm. in diameter by 10–20 mm. long when fully mature, golden-brown, becoming yellowish and pulverulent by germination, the ruptured tegumentary tissues raised about the bases of the sori in an even ring-like manner; teliospores 2-celled, rhombic-oval or narrowly ellipsoid, 15–21 by 42–65 μ, obtuse or acute at both ends, slightly or not constricted at the septum; wall pale cinnamon-brown, uniformly thin, about 1 μ, the pores 2 in each cell, near the septum; pedicel hyaline, cylindrical, uniform, 3–5 μ in diameter, very long.

ON JUNIPERACEAE:
Juniperus barbadensis L. (*Sabina barbadensis* Small), Alabama.
Juniperus virginiana L. (*Sabina virginiana* Ant.), Alabama, Arkansas, Connecticut, Delaware, Florida, Illinois, Indiana, Iowa, Georgia, Kansas, Kentucky, Maryland, Massachusetts, Mississippi, Missouri, Nebraska, New Jersey, New York, North Carolina, Pennsylvania, South Carolina, South Dakota, Tennessee, Texas, Virginia, West Virginia, Wisconsin.

TYPE LOCALITY: North Carolina, on *Juniperus virginiana.*

DISTRIBUTION: Massachusetts and Ontario west to southeastern South Dakota, south to eastern Texas and northern Florida.

ILLUSTRATIONS: Farl. Gymnosp. U. S. *pl. 1, f. 1–6;* Ann. Bot. 1: *pl. 13;* Bull. Iowa Exp. Sta. 84: *f. 1, 2, 5c;* Hedwigia **34**: 3, *f. 8;* Bot. Gaz. **49**: *pl. 21, f. 2;* E. & P. Nat. Pfl. 1^{1**}: *f. 34B;* Bull. N. Y. Bot. Gard. **7**: 474, *f. 35; pl. 151; pl. 161, f. 65, 66.*

EXSICCATI: Ellis & Ev. N. Am. Fungi *2713;* Ellis & Ev. Fungi Columb. *757, 1929, 2029, 2030;* Ellis, N. Am. Fungi *270, 1086a, b;* Kellerm. Ohio Fungi *22;* Kellerm. & Swingle, Kan. Fungi *19;* Carleton, Ured. Am. *39;* Rab.-Wint. Fungi. Eur. *2921;* Rab.-Wint.-Paz. Fungi Eur. *4014;* Seym. & Earle, Econ. Fungi *227a, 228, 229, 229x* (in part), *y* (in part); Shear, N. Y. Fungi *317;* Sydow, Ured. *1195;* Thüm. Myc. Univ. *148, 732;* Rav. Fungi Am. *481;* Vesterg. Micr. Rar. Sel. *633;* Barth. Fungi Columb. *2626, 3328, 3435;* Barth. N. Am. Ured. *107.*

32. **Gymnosporangium bermudianum** (Farl.) Earle; Seym. & Earle, Econ. Fungi *249*. 1892.

Aecidium bermudianum Farl. Bot. Gaz. **12**: 206. 1887.
Tremella bermudiana Arth. Proc. Ind. Acad. Sci. **1900**: 136. 1901.

O. Pycnia not seen.

I. Aecia caulicolous, from a biennial mycelium, appearing on globoid or subreniform galls (6–12 mm. across) of a reddish brown luster, cylindrical, 0.8–1.5 mm. high by 0.1–0.3 mm. in diameter, ruptured tegumentary tissues raised; peridium fragile, soon becoming lacerate, often to base, spreading but not recurved; peridial cells seen in both face and side views, not hygroscopic, remaining straight when wet, narrowly obovate in face view, 18–25 by 50–75 μ, linear-rhomboidal in side view, 15–18 μ thick, the outer wall thin, about 1.5 μ, smooth, the inner wall thicker, 3–5 μ, moderately rugose with closely set, linear, ridge-like papillae of varying length; aeciospores globoid or polygonal, 16–19 by 19–29 μ; wall dark chestnut-brown, moderately thick, 2–2.5 μ, minutely verrucose, appearing smooth, the pores 6–10, scattered.

III. Telia following the aecia on the same galls, few, irregularly disposed, pulvinate, low, roundish, 0.4–0.7 mm. across, dark cinnamon-brown, ruptured tegumentary tissues somewhat evident; teliospores 2-celled, ellipsoid, 18–25 by 34–50 μ, rounded or often somewhat narrowed both above and below, slightly constricted at the septum; wall cinnamon-brown, thin, about 1 μ, the pores 2 in each cell, near the septum; pedicel cylindrical, uniform, 5–6 μ in diameter, rather long, three to four times length of spore.

ON JUNIPERACEAE:
Juniperus barbadensis L. (*Sabina barbadensis* Small), Alabama, Mississippi.
Juniperus bermudiana L. (*Sabina bermudiana* Ant.), Bermuda.
Juniperus lucayana Britton, Bahamas.
Juniperus virginiana L. (*Sabina virginiana* Ant.), Florida, Louisiana, Mississippi.

TYPE LOCALITY: Bermuda, on *Juniperus bermudiana.*

DISTRIBUTION: Along the Gulf coast from Mississippi to Florida, and in the Bermuda and Bahama Islands.

ILLUSTRATIONS: Bot. Gaz. 49: *pl. 21, f. 1;* Bull. N. Y. Bot. Gard. 7: 475, *f. 36; pl. 153, f. 43.*

EXSICCATI: Seym. & Earle, Econ. Fungi *249, 250.*

27. ERIOSPORANGIUM Bertero; Lév. Ann. Sci. Nat. III. 5: 269. 1846.

Argotelium Arth. Résult. Sci. Congr. Bot. Vienne 343, excl. descr. 1906.

Cycle of development includes pycnia, aecia, uredinia, and telia, with distinct alternating phases; autoecious. All sori subepidermal.

Pycnia globoid or flask-shaped, with ostiolar filaments.

Aecia erumpent, inclined to be indefinite, either without peridium, or with a loose and fragile peridium. Aeciospores catenulate, varying from globoid to fusiform; wall colorless, verrucose, usually peridermioid.

Uredinia erumpent, definite, without paraphyses. Urediniospores borne singly on pedicels, globoid or ellipsoid; wall pale yellowish-brown, concolorous, echinulate.

Telia usually definite, without paraphyses. Teliospores two-celled, usually germinating in situ upon maturity; wall usually pale or colorless, and generally smooth.

Type species, *Eriosporangium Baccharidis* (Lév.) Bert. (on *Baccharis montevidensis*).

Host belonging to family Lamiaceae.
- Aecial peridium absent; teliospores long, over 45 μ.
  - Aecia in restricted groups. — 1. *E. Hyptidis.*
  - Aecia scattered over whole plant. — 2. *E. fidelis.*
- Aecial peridium present; teliospores short, under 35 μ. — 3. *E. tucumanense.*

Host belonging to family Carduaceae.
- Aecia present and exclusively considered.
  - Peridium absent; aecia more or less indefinite.
    - Aecia causing hypertrophy, aeciospores evenly verrucose. — 4. *E. evadens.*
    - Aecia causing no hypertrophy.
      - Striations of aeciospores formed by small beads. — 5. *E. punctato-striatum.*
      - Striations of aeciospores formed by elongate warts. — 6. *E. exornatum.*
  - Peridium present; aecia definite.
    - Aecia grouped, from a limited mycelium. — 7. *E. oaxacanum.*
    - Aecia scattered, from a diffuse mycelium. — 11. *E. egregium.*
- Uredinia and telia present and exclusively considered.
  - Teliospores smooth.
    - Teliospores large, over 50 μ long.
      - Pedicels slender. — 4. *E. evadens.*
      - Pedicels inflated. — 5. *E. punctato-striatum.*
    - Teliospores small, under 50 μ long.
      - Telia velvety, often cinereous by germination.
        - Wall of teliospore thin, under 2 μ.
          - Telia low, applanate. — 6. *E. exornatum.*
          - Telia prominent, pulvinate. — 7. *E. oaxacanum.*
        - Wall of teliospore thick, over 2 μ. — 8. *E. sphenicum.*
      - Telia smooth and usually polished. — 9. *E. pistoricum.*
  - Teliospores minutely verrucose or punctate.
    - Wall of teliospore with thin concolorous umbo. — 10. *E. Baccharidis-hirtellae.*
    - Wall of teliospore with thick pale umbo. — 11. *E. egregium.*

1. Eriosporangium Hyptidis (M. A. Curt.) Arthur.

Uredo Hyptidis M. A. Curt. Am. Jour. Sci. II. 6: 353. 1848.
Puccinia Hyptidis Tracy & Earle, Bull. Miss. Exp. Sta. 34: 86. 1895.
Gymnoconia Hyptidis Lagerh. Tromsö Mus. Aarsh. 17: 83. 1895.
Argotelium Hyptidis Arth. Résult. Sci. Congr. Bot. Vienne 343. 1906.

O. Pycnia amphigenous, few in small groups on discolored spots, inconspicuous, flask-shaped, barely protruding above surface of leaf, 110–140 μ broad by 160 175 μ high.

I. Aecia amphigenous, surrounding the pycnia, few in rounded or elongate groups 2–5 mm. across, along the nerves, on somewhat larger reddish spots, round or oval, bullate, 0.5–1 mm. across, somewhat tardily dehiscent by irregular slits, orange-colored fading to dirty-white, overarching epidermis reddish and prominent; peridium wanting; aeciospores globoid, 26–32 by 29–33 μ, mostly 28–30 μ in diameter; wall nearly or quite colorless, appearing very thick, 2.5–3 μ, closely and coarsely verrucose.

II. Uredinia hypophyllous, scattered, round, 0.2–0.5 mm. across, soon naked, dark cinnamon-brown, pulverulent, ruptured epidermis inconspicuous; urediniospores globoid,

22–27 μ in diameter; wall cinnamon-brown, moderately thin, about 1.5 μ, finely echinulate, the pores 2, opposite in the equator, more or less inconspicuous.

III. Telia hypophyllous, scattered, round, small, 0.1–0.3 mm. across, early naked, pulvinate, very pale-brownish, cinereous by germination, ruptured epidermis inconspicuous; teliospores fusiform or lance-oblong, 15–19 by 45–70 μ, narrowed or obtuse at both ends, slightly constricted at the septum; wall nearly or quite colorless, smooth, uniformly thin, about1 μ; pedicel nearly or quite colorless, terete, delicate, one half to once length of spore.

ON LAMIACEAE:
Mesosphaerum capitatum (L.) Kuntze (*Hyptis capitata* Jacq.), Cuba, Porto Rico.
Mesosphaerum rugosum (L.) Poll. (*Hyptis radiata* Willd.), Florida, Mississippi, South Carolina.
Mesosphaerum spicatum (Poir.) Small (*Hyptis spicata* Poir.), Guatemala.
Mesosphaerum suaveolens (L.) Kuntze (*Hyptis suaveolens* Poir.), Cuba, Jamaica.

TYPE LOCALITY: Santee Canal, South Carolina, on *Hyptis radiata*.

DISTRIBUTION: Along the coast from South Carolina to Mississippi, southward through the West Indies and Central America.

2. **Eriosporangium fidelis** Arthur.

Puccinia fidelis Arth. Bull. Torrey Club 38: 369. 1911.

O. Pycnia hypophyllous, grouped among the aecia, prominent, punctiform, in section imperfectly flask-shaped with shallow base, large, 112–144 μ broad by 65 μ high; protruding conoidal mass of ostiolar filaments 60–90μ high.

I. Aecia hypophyllous and caulicolous, abundant, scattered over the whole plant from a diffused mycelium, causing some hypertrophy and etiolation, chiefly seated on the woody tissues and hence often in rows along the veins, bullate, mostly oval, large, 0.8–1.3 mm. across, somewhat tardily dehiscent by irregular slits, orange-colored fading to dirty-white, overarching epidermis reddish and prominent; peridium wanting; aeciospores globoid, 20–24 by 23–30 μ, mostly 23–26 μ in diameter; wall nearly or quite colorless, appearing very thick, 2.5–3 μ, coarsely and closely verrucose.

II. Uredinia hypophyllous, scattered, round, small, 0.1–0.2 mm. across, soon naked, dark cinnamon-brown, pulverulent, ruptured epidermis inconspicuous; urediniospores globoid, 21–24 by 23–26 μ, usually 23–25 μ in diameter; wall cinnamon-brown, rather thin, 1–1.5 μ, finely and abundantly echinulate, the pores usually inconspicuous, apparently 2 near the hilum.

III. Telia hypophyllous, scattered, round, small, 0.1–0.2 mm. across, early naked, pulvinate, very pale-brownish, cinereous by germination, ruptured epidermis inconspicuous; teliospores oblanceolate or fusiform, 17–19 by 50–67 μ, narrowed or obtuse at both ends, somewhat constricted at the septum, the upper cell usually shorter, and somewhat inverted top-shaped; wall nearly or quite colorless, smooth, uniformly thin, 1 μ or less; pedicel nearly or quite colorless, terete, delicate, short, fragile.

ON LAMIACEAE:
Mesosphaerum stellulatum (Benth.) Kuntze (*Hyptis stellulata* Benth.), Jalisco.
Mesosphaerum urticoides (H.B.K.) Kuntze (*Hyptis urticoides* H.B.K.), Guatemala.

TYPE LOCALITY: Hills near Guadalajara, Mexico, on *Hyptis stellulata*.

DISTRIBUTION: Central Mexico and southward.

3. **Eriosporangium tucumanense** (Speg.) Arthur.

Aecidium tucumanense Speg. Anal. Soc. Ci. Arg. 12: 79. 1881.
Aecidium Hyptidis P. Henn. Hedwigia 34: 337. 1895.

O. Pycnia amphigenous, few in small groups on slightly discolored spots, inconspicuous, globoid, barely protruding above surface of leaf, 100–175 μ broad by 100–150 μ high.

I. Aecia amphigenous and caulicolous, few in orbicular groups, or more on thickened spots when caulicolous, orbicular, small, 0.1–0.3 mm. across, soon open, orange-colored fading to dirty-white; peridium very fragile and evanescent, less conspicuous than the ruptured epidermis; peridial cells loosely overlapping, small, 18–26 μ long, linear in radial section, 5–10 μ across, the outer wall thin, 1–1.5 μ, smooth, the inner wall somewhat thicker, about 3 μ, moderately verrucose; aeciospores irregularly ellipsoid or lance-oblong, often acute above, 16–24 by 23–34 μ; wall nearly or quite colorless, moderately thick, 1.5–2.5 μ, closely and finely but conspicuously verrucose.

II. Uredinia chiefly hypophyllous, scattered, round, small, 0.1–0.3 mm. across, soon naked, dark cinnamon-brown, pulverulent, ruptured epidermis inconspicuous; urediniospores globoid, 19–23 μ in diameter; wall cinnamon-brown, thin, 1–1.5 μ, finely echinulate, the pores very indistinct, apparently 2 in the equator.

III. Telia hypophyllous, scattered, round, small, 0.1–0.3 mm. across, early naked, pulvinate, white, ruptured epidermis inconspicuous; teliospores oblong, 16–22 by 30–35 μ, obtuse or rounded at both ends, slightly constricted at the septum; wall colorless, smooth, uniformly thin, about 1 μ; pedicel colorless, terete, delicate, one half to once length of spore.

ON LAMIACEAE:
Mesosphaerum pectinatum (Poir.) Kuntze (*Hyptis pectinata* Poir.), Porto Rico, Jamaica.
TYPE LOCALITY: Province Tucuman, Argentina, on *Hyptis spicata*.
DISTRIBUTION: West Indies; also in South America.

4. **Eriosporangium evadens** (Harkn.) Arth. Résult. Sci. Congr. Bot. Vienne 343. 1906.

Coleosporium Baccharidis Cooke & Harkn. Grevillea **9**: 7. 1880. Not *Eriosporangium Baccharidis* Bertero, 1854.
Puccinia evadens Harkn. Bull. Calif. Acad. **1**: 34. 1884.
Caeoma Negerianum Dietel, Bot. Jahrb. **22**: 357. 1896.

O. Pycnia amphigenous and caulicolous, scattered among the aecia on the leaves and younger branches, inconspicuous, honey-yellow, globoid or ovate, 150–175 μ in diameter.

I. Aecia amphigenous, or more commonly caulicolous, causing fusiform or irregular swellings of the branches, sometimes forming witches' brooms, scattered, oblong or oblong-linear, 0.5–1 mm. wide by 1–4 mm. long, early dehiscent, at first orange-colored, drying to a dirty-white, pulverulent, ruptured epidermis or cortex overarching, when the spores fall away showing pits or fissures; aeciospores irregularly oblong, or oblong-fusiform, 22–26 by 35–60 μ, often narrowed and acute at both ends, but especially above; wall pale-yellow or quite colorless, moderately thick, 2–3 μ, somewhat thicker above, 3–9 μ, noticeably but finely verrucose, with thickly set and irregular warts.

II. Uredinia chiefly hypophyllous, scattered, usually few, round or oblong, 0.1–0.3 mm. long, soon naked, orange-colored, becoming pale, somewhat pulverulent, ruptured epidermis often overarching, otherwise inconspicuous; urediniospores broadly ellipsoid, obovate-ellipsoid, or nearly globoid, 23–27 by 27–35 μ; wall thin, 1.5–2 μ, nearly colorless, finely and rather sparsely verrucose-echinulate, with points about 3 μ apart, the pores small, very indistinct, apparently more than 4 and scattered.

III. Telia chiefly hypophyllous, and to some extent on the young branches, scattered, round, 0.3–1 mm. across, soon naked, pulvinate, pale cinnamon-brown, or cinereous by germination, ruptured epidermis inconspicuous; teliospores oblong or obovate-oblong, 27–32 by 48–63 μ, rounded at both ends, or somewhat narrowed below, somewhat constricted at the septum; wall pale-brownish, or almost colorless, smooth, thin, 1.5–2 μ, usually thicker at the apex, 3–6 μ; pedicel colorless, or slightly tinted, terete, 6–10 μ in diameter, thin-walled, once to twice length of spore.

ON CARDUACEAE:
Baccharis consanguinea Greene, California.
Baccharis Emoryi A. Gray, Arizona.
Baccharis pilularis DC., California.
Baccharis pteronioides DC., Michoacan.
Baccharis sp., Cuba.
TYPE LOCALITY: San Francisco, California, on *Baccharis pilularis*.
DISTRIBUTION: Central California and Arizona southeastward through Mexico, and the West Indies; also in South America.
EXSICCATI; Ellis & Ev. N. Am. Fungi *1843*; Sydow, Ured. *1716*; Rab.-Wint. Fungi Eur. *3208*; Ellis & Ev. Fungi Columb. *53*; Barth. Fungi Columb. *2761*, *2762*.

5. **Eriosporangium punctato-striatum** (Dietel & Neger) Arthur.

Puccinia Baccharidis Dietel & Holway; Dietel, Erythea **1**: 250. 1893. Not *Eriosporangium Baccharidis* Bertero, 1854.
Caeoma punctato-striatum Dietel & Neger, Bot. Jahrb. **22**: 357. 1896.

O. Pycnia amphigenous, numerous, crowded in small orbicular groups, comparatively large, punctiform, globose-flask-shaped, 125–175 μ in diameter; pycniospores globoid, 2–3 μ in diameter.

I. Aecia hypophyllous and caulicolous, when on leaves in orbicular groups surrounding the pycnia, at first bullate, irregular in form, 0.3–1 mm. in longest diameter, soon dehiscent, orange-colored, fading to pale-fuscous when dry, ruptured epidermis overarching, on stems forming long fissures, 5–15 mm., without producing hypertrophy, pulverulent, distinctly fuscous when dry, old fissures more or less closed; peridium wanting; aeciospores fusiform to globoid, mostly ovate-ellipsoid, rounded below, usually somewhat pointed above or even acute, variable in size, 20–29 by 27–60 μ, usually 22–25 by 30–45 μ; wall slightly tinted or colorless, moderately thick, 2–2.5 μ, slightly if at all thicker above, verrucose with rather thickly set punctate beads, arranged in more or less evident longitudinal lines, especially toward the apex.

II. Uredinia amphigenous, scattered, abundant, roundish, 0.1–0.7 mm. across, at first bullate, soon naked, pulverulent, cinnamon-brown, ruptured epidermis usually overarching; urediniospores broadly ellipsoid or obovoid, 20–27 by 29–45 μ; wall thin, 1.5–2.5 μ, pale cinnamon-brown, finely and closely echinulate, with points 1 μ or less apart, the pores evident, usually large, scattered, about 6.

III. Telia chiefly hypophyllous, thickly scattered, round, 0.3–0.8 mm. across, soon naked, pulvinate, pale cinnamon-brown, or cinereous by germination, ruptured epidermis inconspicuous; teliospores oblong, 24–29 by 45–70 μ, rounded or obtuse at both ends, somewhat constricted at the septum; wall pale cinnamon-brown, smooth, thin, about 1.5 μ, a little thicker above, 2–6 μ; pedicel colorless, usually inflated up to 25 μ in diameter near the spore, tapering downward, once to twice length of spore, the wall thin, collapsing upon the germination of the spore.

ON CARDUACEAE:
Baccharis caerulescens A. Gray, Hidalgo.
Baccharis glutinosa Pers., Arizona, New Mexico; Chihuahua, Michoacan, Oaxaca.
Baccharis viminea DC., California.
Baccharis sp., Jalisco, Mexico (state).
TYPE LOCALITY: Pasadena, California, on *Baccharis viminea*.
DISTRIBUTION: From central California and New Mexico south through Mexico; also in South America.
EXSICCATI: Ellis, N. Am. Fungi *1078*; Ellis & Ev. N. Am. Fungi *2244*; D. Griff. W. Am. Fungi *398*.

6. **Eriosporangium exornatum** Arthur.

Puccinia exornata Arth. Bull. Torrey Club 38 : 370. 1911.

O. Pycnia amphigenous, loosely grouped, punctiform, large, honey-yellow, not especially conspicuous; globose-flask-shaped, 120–160 μ in diameter.

I. Aecia hypophyllous, rather closely seated in orbicular groups surrounding the pycnia, groups 1–3 mm. across on larger discolored, unthickened spots, at first bullate, roundish, 0.3–0.5 mm. across, soon dehiscent, orange-colored fading to dirty-white, ruptured epidermis overarching, conspicuous; peridium wanting; aeciospores globoid, 24–27 by 26–32 μ; wall colorless, thick, 3–5 μ, coarsely verrucose with closely set oval beads arranged in longitudinal or slightly spiral series.

II. Uredinia hypophyllous, scattered or somewhat grouped, round, 0.1–0.2 mm. across, soon naked, low, pulverulent, pale cinnamon-brown, ruptured epidermis inconspicuous; urediniospores globoid or obovate-ellipsoid, 20–24 by 24–30 μ; wall thin, 1–1.5 μ, very pale-yellow, finely and sparsely echinulate, the pores indistinct, apparently 3 and approximately equatorial.

III. Telia hypophyllous, resembling uredinia but darker in color, 0.1–0.3 mm. across, soon naked, low, applanate, cinnamon-brown becoming cinereous by germination, ruptured epidermis inconspicuous; teliospores oblong, 19–24 by 37–48 μ, rounded at both ends, somewhat constricted at the septum; wall golden-yellow, smooth, thin, 1 μ, slightly thicker above, 2–4 μ; pedicel colorless, delicate, terete, 5–9 μ in diameter, once to twice length of spore.

ON CARDUACEAE:
Baccharis thesioides H.B.K., Guatemala.
TYPE LOCALITY: Guatemala city, Guatemala, on *Baccharis thesioides*.
DISTRIBUTION: Known only from the type locality.

7. **Eriosporangium oaxacanum** (Dietel & Holway) Arth. Résult. Sci. Congr. Bot. Vienne 343. 1906.

Aecidium fragile Holway, Bot. Gaz. 31 : 331, hyponym. 1901.
Puccinia oaxacana Dietel & Holway ; Holway, Bot. Gaz. 31 : 331. 1901.

O. Pycnia amphigenous, few in a group, minute, inconspicuous, globoid, 80–100 μ broad.

I. Aecia amphigenous, abundant, in groups of 2–6 crowded about the pycnia, often solitary ; peridium cylindrical, 0.1–0.2 mm. in diameter, 0.1–0.3 mm. high, colorless, very delicate and evanescent ; peridial cells loosely overlapping, 40–65 μ long, angularly oblong-fusiform in face view, linear in radial section, 6–10 μ across, the outer wall thin, about 1 μ, smooth, the inner wall somewhat thicker, about 2 μ, strongly verrucose ; aeciospores ovate-oblong or oblong-fusiform, often acute at one or both ends, 16–25 by 29–40 μ ; wall colorless, uniformly thin, about 1 μ, strongly verrucose with closely set beads.

II. Uredinia hypophyllous, not abundant, scattered, round, very small, 0.1–0.3 mm. across, early naked, pulverulent, light cinnamon-brown, ruptured epidermis barely noticeable ; urediniospores broadly obovoid or globoid, 19–23 by 23–28 μ ; wall pale cinnamon-brown, thin, 1 μ, minutely and closely echinulate with points about 1.5 μ apart, the pores very obscure, probably more than 2 and scattered.

III. Telia hypophyllous, numerous, scattered, round, early naked, small, 0.1–0.4 mm. across, pulvinate, dark cinnamon-brown, or cinereous by germination, ruptured epidermis inconspicuous ; teliospores oblong or obovate-oblong, 18–25 by 33–48 μ, rounded or obtuse at both ends, often narrowed below, slightly or not constricted at the septum ; wall smooth, pale yellowish-brown, concolorous, thin, 1–1.5 μ, somewhat thickened at apex, 2–4 μ ; pedicel nearly or quite colorless, terete, slender, 3–8 μ thick, about once length of spore.

ON CARDUACEAE :
Baccharis hirtella DC., Oaxaca.
TYPE LOCALITY : Oaxaca, Mexico, on *Baccharis hirtella*.
DISTRIBUTION : Southeastern Mexico.

8. **Eriosporangium sphenicum** Arthur.

Puccinia sphenica Arth. Bull. Torrey Club 38 : 371. 1911.

O and I. Pycnia and aecia unknown.

II. Uredinia chiefly hypophyllous, scattered, round, very small, 0.1–0.3 mm. across, at first pustular, soon naked, light cinnamon-brown, pulverulent, ruptured epidermis noticeable ; urediniospores broadly obovoid, 19–23 by 24–30 μ ; wall pale-tawny or nearly colorless, moderately thin, 1.5 μ, minutely and rather closely echinulate, the pores not very distinct, 3 or 4, equatorial.

III. Telia hypophyllous, scattered, small, 0.1–0.3 mm. across, early naked, pulvinate, chestnut-brown, ruptured epidermis inconspicuous ; teliospores ellipsoid, 27–32 by 35–45 μ, rounded at both ends, slightly or not constricted at the septum ; wall smooth, chestnut-brown, concolorous, moderately thick, 2.5–4 μ, thicker at the apex, 4–9 μ ; pedicel often inserted obliquely, colorless or somewhat tinted, terete, 6–10 μ thick, thin-walled, fragile, about once length of spore.

ON CARDUACEAE :
Baccharis sordescens DC., Morelos.
TYPE LOCALITY : Cuernavaca, Mexico, on *Baccharis sordescens*.
DISTRIBUTION : Known only from the type locality.

9. **Eriosporangium pistoricum** Arthur.

Puccinia pistorica Arth. Bull. Torrey Club 38 : 372. 1911.

O and I. Pycnia and aecia unknown.

II. Uredinia hypophyllous, abundant, scattered, roundish, large, 0.3–0.8 mm. across, soon dehiscent, but long covered partially by the overarching epidermis, light cinnamon-brown, somewhat pulverulent ; urediniospores globoid, or obovate-globoid, 24–32 by 30–39 μ ; wall pale-yellowish, or almost colorless, moderately thin, about 2 μ, sparsely and strongly echinulate with points about 3 μ apart, the pores small, very indistinct, probably few and scattered.

III. Telia amphigenous, in compact irregular groups, from punctiform to 1 mm. across, soon naked, chocolate-brown or blackish, usually shining, ruptured epidermis inconspicuous, or in small flecks giving a grayish appearance to the surface, no germination in situ seen; teliospores linear-oblong or oblong-lanceolate, small, 12–16 by 39–50 μ, obtuse or rounded above, narrowed below, slightly or not constricted at the septum; wall smooth, chestnut-brown above, very much lighter toward the base, thin, 1–1.5 μ, much thickened above, 6–12 μ; pedicel tinted, slender, 3–5 u in diameter, terete, tapering downward, one half length of spore or less.

ON CARDUACEAE:
Baccharis glomeruliflora Pers., Florida.
TYPE LOCALITY: Mt. Dora, Florida, on *Baccharis glomeruliflora*.
DISTRIBUTION: Known only from the type locality.

10. **Eriosporangium Baccharidis-hirtellae** (Dietel & Holway) Arth. Résult. Sci. Congr. Bot. Vienne 343. 1906.

Puccina Baccharidis-hirtellae Dietel & Holway; Holway, Bot. Gaz. **31**: 331. 1901.

O and I. Pycnia and aecia unknown.

II. Uredinia hypophyllous, abundant; scattered, round, small, 0.1–0.3 mm. across, at first bullate, early naked, pulverulent, cinnamon-brown, ruptured epidermis barely noticeable; urediniospores broadly obovate or globoid, 18–21 by 20–26 μ; wall pale cinnamon-brown, thin, 1–1.5 μ, strongly verrucose-echinulate with points about 3 μ apart, the pores obscure, probably 3 or 4 and equatorial.

III. Telia hypophyllous, abundant, scattered, round, early naked, small, 0.2–0.5 mm. across, pulvinate, chestnut-brown, or somewhat cinereous by germination, ruptured epidermis inconspicuous; teliospores ellipsoid, 24–30 by 35–42 μ, rounded at both ends, or somewhat obtuse below, slightly constricted at the septum; wall minutely verrucose or punctate especially toward the upper part, light chestnut-brown, concolorous, moderately thick, 1.5–2.5 μ, thicker above, 3–7 μ; pedicel nearly or quite colorless, terete, slender, 3–5 μ thick, about once length of spore.

ON CARDUACEAE:
Baccharis hirtella DC., Mexico (state).
TYPE LOCALITY: Amecameca, Mexico, on *Baccharis hirtella*.
DISTRIBUTION: Central Mexico.

11. **Eriosporangium egregium** Arthur.

Puccinia egregia Arth. Bull. Torrey Club **38**: 370. 1911.

O. Pycnia hypophyllous, preceding the aecia, numerous, especially along the veins, punctiform, inconspicuous, honey-yellow, in section flattened-globoid, 140–175 μ broad by 100–130 μ high; ostiolar filaments about 60 μ long.

I. Aecia hypophyllous and caulicolous, abundant, scattered over the whole plant from a diffused mycelium, causing etiolation, at first more numerous along the veins and stems, bullate, mostly oval, large, 0.5–1 mm. across, the prominent peridium soon bursting through the swollen, reddish base; peridium cylindrical, or flattened laterally, large, 0.3–0.5 mm. in diameter, 0.5–0.8 mm. high, fragile and somewhat evanescent; peridial cells loosely overlapping, ellipsoidal in face view, linear-rhomboidal in radial section, 30–50 μ long, 10–15 μ across, the outer wall thin, about 2 μ, smooth, the inner wall somewhat thicker, about 3 μ, strongly verrucose; aeciospores broadly ellipsoid or globoid, 16–21 by 19–26 μ; wall colorless, thin, 1.5 μ, strongly verrucose with closely set beads.

II. Uredinia not seen; urediniospores intermixed with the teliospores, globoid, 21–26 by 24–29 μ; wall cinnamon-brown, rather thin, about 1.5 μ, finely echinulate, the pores indistinct, apparently 2 and equatorial.

III. Telia hypophyllous, scattered, round, usually small, 0.1–0.2 mm. across, early naked, loosely pulvinate, becoming pulverulent, chestnut-brown, ruptured epidermis inconspicuous; teliospores ellipsoid, or obovate-ellipsoid, 21–27 by 35–45 μ, rounded or somewhat narrowed at the base, obtuse or rounded at the apex, slightly constricted at the septum; wall minutely verrucose or punctate, cinnamon-brown, thin, 1.5 μ, much thickened at apex

by a broad, pale umbo, 6–10 μ, often appearing vertically striate, the pore of the lower cell next to the septum, usually with the wall much thickened; pedicel colorless, delicate, fragile, short.

ON CARDUACEAE:
Baccharis oaxacana Greenm., Oaxaca.
TYPE LOCALITY: Mt. Oaxaca, Mexico, on *Baccharis oaxacana*.
DISTRIBUTION: Known only from the type locality.

28. **ARGOMYCES** Arthur, gen. nov.

Argomyces replaces *Argotelium* as described in Résult. Sci. Congr. Bot. Vienne 343 (1906), and used in the key on page 130; the change is necessitated by an error in the citation of the type species.

Cycle of development includes pycnia, uredinia, and telia; autoecious. All sori subepidermal.

Pycnia globoid or flask-shaped, with ostiolar filaments.

Uredinia erumpent, definite, usually without paraphyses. Urediniospores borne singly on pedicels, globoid or ellipsoid; wall yellowish-brown, concolorous, echinulate.

Telia usually definite, without paraphyses. Teliospores two-celled, usually germinating in situ upon maturity; wall pale or colorless, and generally smooth.

Type species, *Argomyces parilis* Arth. (on *Hyptis pectinata*).

Host belonging to family Lamiaceae.	1. *A. parilis.*
Host belonging to family Oxalidaceae.	2. *A. Oxalidis.*
Host belonging to family Carduaceae.	
Teliospore-wall uniformly thick.	3. *A. Vernoniae.*
Teliospore-wall thicker above.	4. *A. Baccharidis-multiflorae.*

1. **Argomyces parilis** Arthur, sp. nov.

O. Pycnia epiphyllous, few in small groups on discolored spots 1 or 2 mm. across, inconspicuous, globoid, 130–160 μ in diameter.

II. Uredinia hypophyllous, scattered, round, 0.1–0.4 mm. across, early naked, very pulverulent, chestnut-brown, ruptured epidermis inconspicuous; urediniospores globoid, or less often broadly ellipsoid, 19–24 by 20–30 μ, usually 20–23 μ in diameter; wall dark cinnamon-brown, concolorous, moderately thick, 1.5–3 μ, strongly and evenly echinulate, with points about 2 μ apart, the pores 2 or 3 near the hilum, not very distinct.

III. Telia hypophyllous, scattered, abundant, round, small, 0.1–0.3 mm. across, early naked, pulvinate, white, ruptured epidermis inconspicuous; teliospores oblong or lance-oblong, 16–20 by 35–50 μ, narrowed or obtuse at both ends, slightly constricted at the septum; wall smooth, nearly or quite colorless, uniformly thin, about 1 μ; pedicel colorless, terete, delicate, one half to once length of spore.

ON LAMIACEAE:
Mesosphaerum pectinatum (Poir.) Kuntze (*Hyptis pectinata* Poir.), Jalisco, Morelos, Oaxaca.
Type collected at Oaxaca, Mexico, on *Hyptis pectinata*, November 15, 1903, *E. W. D. Holway 5419*.
DISTRIBUTION: Central and southern Mexico.

2. **Argomyces (?) Oxalidis** (Lév.) Arthur.

Uredo Oxalidis Lév. Ann. Sci. Nat. II. 16: 240. 1841.
Uredo Oxalidearum Cooke, Grevillea 10: 123. 1882.
Puccinia Oxalidis Dietel & Ellis; Dietel, Hedwigia 34: 291. 1895.
Dicaeoma Oxalidis Kuntze, Rev. Gen. 3^3: 469. 1898.

O. Pycnia unknown.

II. Uredinia hypophyllous, in orbicular or irregular groups, 2–5 mm. across, often covering the whole surface, round, 0.3 mm. across or less, somewhat confluent, soon naked, pale yellowish-white, at first waxy, becoming pulverulent, ruptured epidermis rather inconspicuous; urediniospores globoid, or elliptical-globoid, 16–19 by 17–24 μ; wall very pale-yellow, very thin 0.8–1 μ, minutely echinulate, the pores uncertain.

III. Telia hypophyllous, in orbicular or irregular groups 2–5 mm. across, often covering the whole surface, round, 0.3 mm. across or less, somewhat confluent, soon naked, very pale brownish-yellow, waxy, ruptured epidermis inconspicuous; teliospores ellipsoid or

broadly oblong, 13–20 by 18–28 μ, rounded or obtuse at both ends, slightly or not constricted at the septum; wall nearly or quite colorless, smooth, uniformly thin, 0.5–0.8 μ; pedicel colorless, thick, very short.

ON OXALIDACEAE:
Ionoxalis divaricata Small, Mexico (state).
Ionoxalis latifolia (H.B.K.) Rose (*Oxalis latifolia* H.B.K.), Mexico.
Ionoxalis Martiana (Zucc.), Small (*Oxalis Martiana* Zucc.), Jamaica.
Ionoxalis tetraneuris Small, Mexico (state).
Ionoxalis trinervis Small, Mexico (state).
Ionoxalis vallicola Rose, Mexico (state).
Ionoxalis violacea (L.) Small, (*Oxalis violacea* L.), New Mexico, Texas.
Ionoxalis (?) sp. (*Oxalis* sp.), Veracruz.
TYPE LOCALITY: Mexico, on *Oxalis* sp. [probably *O. latifolia*].
DISTRIBUTION: Texas and New Mexico southward through Mexico and the West Indies; also in South America.
EXSICCATI: Ellis & Ev. N. Am. Fungi *2716*.

3. **Argomyces Vernoniae** Arthur, sp. nov.

O. Pycnia epiphyllous, gregarious, few in small groups 0.5–1 mm. across, punctiform, dark reddish-brown, globoid, 80–115 μ in diameter; ostiolar filaments rather short, about 35 μ long.

II. Uredinia hypophyllous, solitary or often surrounded by the telia, not usually abundant, roundish, about 0.5 mm. across, bright cinnamon-brown, ruptured epidermis evident; urediniospores flattened-globoid or globoid, 24–29 μ broad by 23–26 μ long; wall pale-yellow, 1.5–2 μ thick, moderately and prominently echinulate, the pores indistinct, apparently 4, equatorial.

III. Telia hypophyllous, usually in irregular groups 1.5–2 mm. across, roundish, 0.2–0.3 mm. across, pulvinate, light chestnut-brown, or cinereous by germination, ruptured epidermis not conspicuous; teliospores narrowly ellipsoid or fusiform, 16–24 by 55–70 μ, narrowed above and below, usually considerably constricted at the septum; wall cinnamon-brown, uniformly thin, about 1 μ, smooth; pedicel fragile, colorless, one half to once length of spore.

ON CARDUACEAE:
Vernonia borinquensis Urban, Porto Rico.
Vernonia sp., St. Croix.
Type collected at Cayey, Porto Rico, on *Vernonia borinquensis*, January, 1911, *E. W. D. Holway 3*.
DISTRIBUTION: West Indies.

4. **Argomyces Baccharidis-multiflorae** (Dietel & Holway) Arthur.

Puccinia Baccharidis-multiflorae Dietel & Holway; Holway, Bot. Gaz. **31**: 331. 1901.
Eriosporangium Baccharidis-multiflorae Arth. Result. Sci. Congr. Bot. Vienne 343. 1906.

O. Pycnia epiphyllous, few in a group, punctiform, inconspicuous, in section flattened-globoid, 100–112 μ broad by 70–90 μ high; ostiolar filaments 29–32 μ long.

II. Uredinia at first epiphyllous surrounding the pycnia, soon hypophyllous, round, 0.2–0.5 mm. across, early naked, pulverulent, bright cinnamon-brown, ruptured epidermis evident; urediniospores obovate, 21–29 by 30–39 μ, rounded or obtuse above, usually narrowed below; wall golden-brown, concolorous, moderately thin, 1–2 μ, greatly thickened above, 3–7 μ, strongly and sparsely echinulate with points about 3 μ apart, the pores 3, prominent, equatorial, usually covered by the hyaline lens-shaped cuticle.

III. Telia hypophyllous, abundant, scattered, round, early naked, 0.3–0.7 mm. across, pulvinate, light chestnut-brown, or cinereous by germination, ruptured epidermis inconspicuous; teliospores broadly oblong, or oblong-obovate, 21–27 by 40–50 μ, rounded or obtuse at both ends, slightly constricted at the septum; wall smooth, cinnamon-brown, often paler at the apex, thin, 1–1.5 μ, greatly thickened above, 5–12 μ, also greatly thickened (3–7 μ) over the pore of the lower cell close to the septum; pedicel nearly or quite colorless, terete, slender, 5–7 μ thick, one half to once and a half length of spore.

ON CARDUACEAE:
Baccharis elegans H.B.K., Oaxaca.
Baccharis multiflora H.B.K., Mexico (state).
TYPE LOCALITY: Amecameca, Mexico, on *Baccharis multiflora*.
DISTRIBUTION: Central and southeastern Mexico.

29. **POLIOMA** Arth. Jour. Myc. **13**: 29. 1907.

Cycle of development includes pycnia and telia, both subepidermal.

Pycnia globoid or flask-shaped.

Telia erumpent, somewhat indefinite, without peridium or paraphyses. Teliospores two-celled, usually germinating in situ upon maturity; wall pale or colorless, generally smooth.

Type species, *Puccinia nivea* Holway (on *Salvia purpurea*).

Teliospores long, 48 μ or more. 1. *P. nivea*.
Teliospores short, 40–48 μ. 2. *P. delicatula*.

1. **Polioma nivea** (Holway) Arth. Jour. Myc. **13**: 29. 1907.

Puccinia nivea Holway, Jour. Myc. 11: 158. 1905.

O. Pycnia epiphyllous, in small groups, inconspicuous, subepidermal, honey-yellow, globose-flask-shaped, almost wholly immersed, large, 130–160 μ broad by 110–145 μ high; pycniospores globoid, 3–4 μ in diameter.

III. Telia chiefly hypophyllous, gregarious, often confluent, in compact groups, 1–2 mm. across, round, 0.3–0.4 mm. in diameter, soon naked, pulvinate, dirty-white becoming cinereous by germination, ruptured epidermis not noticeable; teliospores clavate-oblong, rounded or obtuse at apex, 21–23 by 48–61 μ, slightly constricted at the septum; wall colorless, moderately thin, 1–2 μ, slightly or not thickened at apex, smooth; pedicel hyaline, short.

ON LAMIACEAE:
Salvia purpurea Cav., Oaxaca.
TYPE LOCALITY: Oaxaca, Mexico, on *Salvia purpurea*.
DISTRIBUTION: Known only from the type locality.

2. **Polioma delicatula** Arth. Jour. Myc. **13**: 29. 1907.

O. Pycnia unknown.

III. Telia hypophyllous, scattered or sometimes confluent in compact groups, round, 0.3–0.4 mm. across, soon naked, pulvinate, dirty-white becoming cinereous by germination, ruptured epidermis not noticeable; teliospores oblong or lanceolate-oblong, rounded or obtuse at apex, 12–15 by 40–48 μ, slightly or not constricted at septum; wall colorless, moderately thin, 1–2 μ, not thickened above, smooth; pedicel hyaline, short.

ON LAMIACEAE:
Salvia elegans Vahl, Mexico (state).
TYPE LOCALITY: Sacred Mount, Amecameca, Mexico, on *Salvia elegans*.
DISTRIBUTION: Known only from the type locality.

30. **NIGREDO** Roussel, Fl. Calvados ed. 2. 47. 1806.

Uredo § *Nigredo* Pers. Syn. Fung. 220. 1801.
Caeoma § *Caeomurus* Link, Ges. Nat. Freunde Berlin Mag. **3**: 7. 1809.
Hypodermium § *Uromyces* Link, Ges. Nat. Freunde Berlin Mag. **7**: 28. 1815.
Caeomurus S. F. Gray, Nat. Arr. Brit. Pl. **1**: 541. 1821.
Uromyces Unger, Exanth. Pfl. 277. 1833.
Capitularia Rab. Bot. Zeit. 9: 449. 1851.
Puccinella Fuckel, Symb. Myc. 60. 1869.

Cycle of development includes pycnia, aecia, uredinia, and telia, with distinct alternating phases; autoecious and heteroecious. Pycnia and other sori subepidermal.

Pycnia deep-seated, usually globoid or flask-shaped, with ostiolar filaments.

Aecia erumpent, cupulate or cylindrical. Peridium colorless, dehiscent by apical rupture, the margins lacerate or erose, erect, spreading, or recurved. Aeciospores catenulate, globoid or ellipsoid, often angular; wall colorless, verrucose.

Uredinia erumpent, definite, without peridium, and without paraphyses (except in a few species). Urediniospores borne singly on pedicels, globoid, ellipsoid, or obovoid; wall colored, echinulate or rarely verrucose, the pores two to several (one in *N. uniporula*), variously arranged.

Telia erumpent or long covered by the epidermis. Teliospores free, pedicelled, one-celled; wall colored, firm, smooth or verrucosely sculptured, the pore one, apical.

Type species, *Uredo Betae* Pers. (on *Beta vulgaris*).

Aecia present and exclusively considered.

Aecia scattered, from diffused mycelium, often causing etiolation.
Aecia on plants same as or related to those bearing later stages.
Aecia rather loosely scattered. 30. *N. Caladii.*
Aecia rather crowded.
Host belonging to family Euphorbiaceae. 69. *N. proëminens.*
Host belonging to family Onagraceae. 72. *N. plumbaria.*
Aecia on plants dissimilar and unrelated to those bearing later stages.
Aecia rather loosely scattered. 41. *N. houstoniata.*
Aecia rather crowded.
Peridial cells abutted. 47. *N. caryophyllina.*
Peridial cells overlapping. 58. *N. punctata.*
Aecia grouped, from limited mycelium.
Aecia on plants same as or related to those bearing later stages.
Host belonging to family Melanthaceae. 37. *N. Zygadeni.*
Host belonging to family Alliaceae.
Aeciospores globoid (20–24 × 23–26 μ). 38. *N. aemula.*
Aeciospores longer than broad (21–26 × 25–35 μ). 39. *N. bicolor.*
Host belonging to family Liliaceae. 40. *N. Lilii.*
Host belonging to family Iridaceae. 42. *N. proba.*
Host belonging to family Polygonaceae.
Aeciospores small, under 20 μ in diameter. 43. *N. Polygoni.*
Aeciospores large, over 20 μ in diameter. 44. *N. intricata.*
Host belonging to family Chenopodiaceae. 45. *N. Betae.*
Host belonging to family Caryophyllaceae. 48. *N. Silenes.*
Host belonging to family Fabaceae.
Aeciospores small, under 17 μ in breadth.
Aeciospores globoid (11–15 × 13–16 μ). 49. *N. Lespedezae-procumbentis.*
Aeciospores longer than broad (12–17 × 16–21 μ). 60. *N. Trifolii.*
Aeciospores medium-sized, 15–21 μ in breadth, ellipsoid.
Peridial cells with outer wall thick (6–9 μ). 54. *N. Fabae.*
Peridial cells with outer wall moderately thin (4–5 μ). 64. *N. appendiculata.*
Aeciospores large, 18–24 μ in breadth, globoid.
Aeciospore-wall moderately thick (1.5–2 μ). 55. *N. Lupini.*
Aeciospore-wall thin (1–1.5 μ). 50. *N. Hedysari-paniculati.*
Host belonging to family Malpighiaceae. 68. *N. Galphimiae.*
Host belonging to family Hypericaceae. 71. *N. Hyperici-frondosi.*
Host belonging to family Armeriaceae. 73. *N. Limonii.*
Host belonging to family Rubiaceae.
Aeciospores ellipsoid (19–24 × 26–30 μ). 79. *N. Bouvardiae.*
Aeciospores globoid (21–26 × 21–28 μ). 80. *N. Spermacoces.*
Host belonging to family Carduaceae.
Aeciospores 15–22 × 18–24 μ. 82. *N. Martinii.*
Aeciospores 19–24 × 22–26 μ. 83. *N. cucullata.*
Aecia on plants dissimilar and unrelated to those bearing later stages.
Host belonging to family Chenopodiaceae. 19. *N. Peckiana.*
Host belonging to family Caryophyllaceae. 20. *N. Polemonii.*
Host belonging to family Ranunculaceae. 16. *N. Poae.*
Host belonging to family Violaceae. 2. *N. pedatata.*
Host belonging to family Ammiaceae. 25. *N. Scirpi.*
Host belonging to family Primulaceae.
Aeciospores with wall moderately thin (1.5–2 μ). 20. *N. Polemonii.*
Aeciospores with wall very thin (1 μ). 25. *N. Scirpi.*
Host belonging to family Polemoniaceae. 20. *N. Polemonii.*
Host belonging to family Plantaginaceae. 7. *N. seditiosa.*
Host belonging to family Ambrosiaceae. 34. *N. Junci.*
Host belonging to family Carduaceae.
Host belonging to genus Aster, or Solidago. 28. *N. perigynia.*
Host belonging to genus Arnica, or Cirsium. 34. *N. Junci.*
Host belonging to genus Silphium. 35. *N. Silphii.*

Uredinia and telia present and exclusively considered.

Uredinia and telia inhabiting monocotyledonous hosts.
Host belonging to family Sparganiaceae. 1. *N. Sparganii.*
Host belonging to family Poaceae.
Urediniospore-pores equatorial.
Urediniospore-wall moderately thick (2 μ and more).
Urediniospores ellipsoid; wall echinulate. 21. *N. arguta.*
Urediniospores globoid or subgloboid.

- Urediniospore-wall verrucose-echinulate.
  - Urediniospores very small (13–17 × 16–19 μ). — 2. *N. pedatata.*
  - Urediniospores medium-sized (15–19 × 18–23 μ). — 4. *N. graminicola.*
- Urediniospore-wall echinulate. — 6. *N. major.*
- Urediniospore-wall verrucose. — 7. *N. seditiosa.*

Urediniospore-wall moderately thin (2 μ and less).

- Teliospore-wall evenly thick. — 5. *N. leptoderma.*
- Teliospore-wall thicker above.
  - Teliospores small (14–27 μ long).
    - Apex of teliospores smooth, with a paler umbo. — 8. *N. minima.*
    - Apex of teliospores covered with digitate projections. — 9. *N. Halstedii.*
  - Teliospores large (25–43 μ long). — 10. *N. Sporoboli.*

Urediniospore-pores scattered.

Urediniospore-wall moderately thin (2 μ and less).

- Urediniospore-wall verrucose-echinulate.
  - Pores rather few, 4–6. — 11. *N. Eragrostidis.*
  - Pores rather numerous, 6–10.
    - Teliospore-wall only slightly thicker above (2–3 μ). — 12. *N. Alopecuri.*
    - Teliospore-wall much thicker above (3–7 μ).
      - Teliospore-wall cinnamon-brown; pedicel tinted. — 13. *N. amphidyma.*
      - Teliospore-wall chestnut-brown; pedicel colorless. — 14. *N. Hordei.*
- Urediniospore-wall echinulate.
  - Pores rather few, 4–6.
    - Teliospore-wall light golden-brown; pedicel as long as spore or less. — 16. *N. Poae.*
    - Teliospore-wall chestnut-brown; pedicel two or three times as long as spore. — 17. *N. Epicampis.*
  - Pores rather numerous, 6–10.
    - Teliospore-wall thin (1.5 μ), apex much thicker (5–7 μ). — 18. *N. Aegopogonis.*
    - Teliospore-wall thick (3–5 μ), apex somewhat thicker (4–7 μ). — 3. *N. Clignyi.*

Urediniospore-wall moderately thick (2 μ and more).

- Urediniospore-wall verrucose. — 19. *N. Peckiana.*
- Urediniospore-wall echinulate.
  - Teliospore-wall evenly thick. — 15. *N. mystica.*
  - Teliospore-wall thicker above. — 20. *N. Polemonii.*

Host belonging to family Cyperaceae.

- Urediniospore-pores equatorial.
  - Urediniospores with 2 pores (occasionally 3 in *N. minuta*).
    - Urediniospore-wall sparsely echinulate.
      - Urediniospores small (10–15 × 15–19 μ). — 26. *N. minuta.*
      - Urediniospores medium-sized (15–19 × 19–29 μ). — 22. *N. Eleocharidis.*
    - Urediniospore-wall finely verrucose-echinulate. — 23. *N. Rhyncosporae.*
  - Urediniospores with 3 pores. — 24. *N. Scleriae.*
  - Urediniospores with 4 pores.
    - Urediniospores large (18–21 × 26–31 μ). — 25. *N. Scirpi.*
    - Urediniospores medium-sized (16–19 × 19–26 μ). — 27. *N. valens.*
- Urediniospore-pores extra-equatorial.
  - Pores 2, super-equatorial. — 28. *N. perigynia.*
  - Pore 1, below, near the hilum. — 29. *N. uniporula.*

Host belonging to family Araceae.

- Urediniospore-wall thicker above, pores 4. — 30. *N. Caladii.*
- Urediniospore-wall not thicker above, pores 2 (or 3). — 31. *N. pyriformis.*

Host belonging to family Commelinaceae. — 32. *N. Commelinae.*

Host belonging to family Pontederiaceae. — 33. *N. Pontederiae.*

Host belonging to family Juncaceae.

- Urediniospore-pores 2.
  - Urediniospores verrucose, the pores equatorial. — 34. *N. Junci.*
  - Urediniospores echinulate, the pores super-equatorial. — 35. *N. Silphii.*
- Urediniospore-pores 3 or 4. — 36. *N. Junci-effusi.*

Host belonging to family Melanthaceae. — 37. *N. Zygadeni.*

Host belonging to family Alliaceae.

- Urediniospore-pores 5–8; teliospores globoid. — 38. *N. aemula.*
- Urediniospore-pores 7–12; teliospores obovoid. — 39. *N. bicolor.*

Host belonging to family Liliaceae. — 40. *N. Lilii.*

Host belonging to family Iridaceae.

- Urediniospores small (16–19 × 23–26 μ); teliospores pale-yellow. — 41. *N. houstoniata.*
- Urediniospores large (19–23 × 26–31 μ); teliospores dark cinnamon-brown. — 42. *N. proba.*

Uredinia and telia inhabiting dicotyledonous hosts.

Host belonging to family Polygonaceae.

Urediniospores verrucose ; pores 4, equatorial. 43. *N. Polygoni.*
Urediniospores echinulate ; pores 3–6, scattered. 44. *N. intricata.*
Host belonging to family Chenopodiaceae. 45. *N. Betae.*
Host belonging to family Amaranthaceae. 46. *N. Celosiae.*
Host belonging to family Caryophyllaceae.
Teliospore-wall evenly thick ; pedicel fragile. 47. *N. caryophyllina.*
Teliospore-wall much thicker above ; pedicel persistent. 48. *N. Silenes.*
Host belonging to family Fabaceae.
Teliospores globoid, ellipsoid, or obovoid.
Teliospore-wall greatly thickened above, 5–12 μ ; pedicels persistent.
Uredinia with encircling paraphyses.
Paraphyses numerous, incurved, prominent. 49. *N. Lespedezae-procumbentis.*
Paraphyses few, straight, inconspicuous. 50. *N. Hedysari-paniculati.*
Uredinia without encircling paraphyses.
Urediniospore-pores 3 or 4, approximately equatorial.
Teliospores with pedicels very long. 51. *N. mexicana.*
Teliospores with pedicels twice length of spore or less.
Teliospores rounded above and below. 53. *N. Indigoferae.*
Teliospores narrowed above and below. 54. *N. Fabae.*
Urediniospore-pores scattered.
Pores 3 or 4 (some also equatorial). 54. *N. Fabae.*
Pores 6–8. 55. *N. Lupini.*
Teliospore-wall slightly or not thickened above ; pedicels fragile.
Urediniospore-pores scattered, 6–8.
Teliospores evenly verrucose. 56. *N. occidentalis.*
Teliospores striately verrucose. 57. *N. substriata.*
Urediniospore-pores scattered, 3–6 (in occasional spores equatorial).
Teliospores finely and evenly verrucose. 58. *N. punctata.*
Teliospores with a few fine verrucose beads, or smooth. 59. *N. fallens.*
Urediniospore-pores equatorial, 3 or 4.
Teliospores smooth or with a few fine verrucose beads. 60. *N. Trifolii.*
Teliospores evenly verrucose.
Teliospore-wall thin, 1.5–2 μ.
Apex of teliospore with hyaline papilla. 61. *N. Coluteae.*
Apex of teliospore with low umbo. 62. *N. Cologaniae.*
Teliospore-wall thick, 3–4 μ. 52. *N. tenuistipes.*
Teliospores striately verrucose. 63. *N. Medicaginis.*
Urediniospore-pores equatorial, 2 (in occasional spores 3).
Teliospores with a few fine verrucose beads. 64. *N. appendiculata.*
Teliospores evenly and minutely verrucose. 65. *N. Clitoriae.*
Teliospores lanceolate or narrowly ellipsoid.
Urediniospores sparsely echinulate, pores 3, equatorial. 66. *N. Neurocarpi.*
Urediniospores closely echinulate, pores 4, equatorial. 67. *N. Dolichi.*
Host belonging to family Malpighiaceae. 68. *N. Galphimiae.*
Host belonging to family Euphorbiaceae. 69. *N. proëminens.*
Host belonging to family Rhamnaceae. 70. *N. Gouaniae.*
Host belonging to family Hypericaceae. 71. *N. Hyperici-frondosi.*
Host belonging to family Onagraceae. 72. *N. plumbaria.*
Host belonging to family Armeriaceae. 73. *N. Limonii.*
Host belonging to family Gentianaceae.
Urediniospores with 3–6 scattered (rarely equatorial) pores. 74. *N. speciosa.*
Urediniospores with 4 equatorial pores. 75. *N. Gentianae.*
Host belonging to family Asclepiadaceae. 76. *N. Howei.*
Host belonging to family Solanaceae. 77. *N. Solani.*
Host belonging to family Acanthaceae. 78. *N. Ruelliae.*
Host belonging to family Rubiaceae.
Teliospore-wall very thick, over 6 μ. 79. *N. Bouvardiae.*
Teliospore-wall moderately thick, 2–3 μ. 80. *N. Spermcoces.*
Host belonging to family Cucurbitaceae. 81. *N. Helleriana.*
Host belonging to family Carduaceae.
Teliospore-wall moderately thick (2.5–3 μ), indistinctly verrucose. 82. *N. Martinii.*
Teliospore-wall thick (4–5 μ), coarsely verrucose. 83. *N. cucullata.*

1. **Nigredo Sparganii** (Cooke & Peck) Arthur.

Uromyces Sparganii Cooke & Peck ; Peck, Ann. Rep. N. Y. State Mus. 26 : 77. 1874.

O and I. Pycnia and aecia unknown.

II. Uredinia amphigenous, scattered or sometimes somewhat grouped, oval or oblong,

about 0.5–0.8 mm. long, rather early naked, pulverulent, cinnamon-brown, ruptured epidermis noticeable; urediniospores broadly ellipsoid or obovoid, 15–18 by 18–24 μ; wall golden-brown, rather thin, 1–1.5 μ, rather finely and sparsely echinulate, the pores 2 or 3, equatorial.

III. Telia amphigenous, densely crowded in small roundish or irregular groups, occasionally solitary, oval or oblong, small, 0.2–0.5 mm. long, often confluent, soon naked, pulvinate, compact, blackish, ruptured epidermis not conspicuous; teliospores pyriform or obovoid, 15–19 by 20–27 μ, rounded, obtuse or truncate at the apex, narrowed below; wall cinnamon-brown, 1.5–2 μ thick, much thicker above, 5–7 μ, smooth; pedicel tinted, about length of spore or less.

ON SPARGANIACEAE:
Sparganium eurycarpum Engelm., Illinois, Iowa, Nebraska, New York, Ohio, Wisconsin; Ontario.
TYPE LOCALITY: Buffalo, New York, on *Sparganium* [*eurycarpum*].
DISTRIBUTION: Eastern Ontario to Nebraska.
EXSICCATI: Kellerm. Ohio Fungi *200*; Sydow, Ured. *554*, *2304*; Rab.-Wint. Fungi Eur. *2904*; Barth. Fungi Columb. *2398*; Barth. N. Am. Ured. *197*.

2. **Nigredo pedatata** (Schw.) Arthur.

Caeoma (*Aecidium*) *pedatatum* Schw. Trans. Am. Phil. Soc. II. **4**: 293. 1832.
Caeoma (*Aecidium*) *sagittatum* Schw. Trans. Am. Phil. Soc. II. **4**: 293. 1832.
Aecidium (*Caeoma*) *pedatatum* Schw. Trans. Am. Phil. Soc. II. **4**: 309. 1832.
Aecidium (*Caeoma*) *sagittatum* Schw. Trans. Am. Phil. Soc. II. **4**: 309. 1832.
Aecidium Petersii Berk. & Curt.; Berk. Grevillea **3**: 61. 1874.
Uromyces Andropogonis Tracy, Jour. Myc. **7**: 281. 1893.
Caeomurus Andropogonis Kuntze, Rev. Gen. 3^3: 449. 1898.
Nigredo Andropogonis Arth. Résult. Sci. Congr. Bot. Vienne 343. 1906.
Uromyces pedatatus J. Sheldon, Torreya **10**: 90. 1910.

O. Pycnia chiefly epiphyllous, gregarious, rather loosely arranged in groups on pale orbicular spots 1–5 mm. across, not conspicuous, honey-yellow becoming blackish-brown, globose, 40–60 μ in diameter.

I. Aecia hypophyllous, gregarious, usually crowded on pale orbicular spots 1–5 mm. across, cupulate, short, small, 0.2–0.3 mm. across; peridium colorless, the margin erose and somewhat recurved; peridial cells rhomboidal in longitudinal section, 12-18 μ thick by 15–21 μ long, slightly overlapping, the outer wall rather thick, 5–8 μ, transversely striate, smooth, the inner wall much thinner, 2–3 μ, moderately verrucose; aeciospores subglobose, often somewhat angular from compression, small, 10–16 by 12–18 μ; wall thin, 1–1.5 μ, minutely verrucose.

ON VIOLACEAE:
Viola lanceolata L., Delaware.
Viola pedata L., Pennsylvania.
Viola primulaefolia L., District of Columbia, Georgia, Mississippi.
Viola sagittata L., Delaware, Pennsylvania.

II. Uredinia hypophyllous, scattered, oval or oblong, small, 0.2–0.4 mm. long, sometimes confluent, early naked, light-brown, somewhat pulverulent, ruptured epidermis not noticeable; urediniospores subgloboid or very broadly ellipsoid, 13–17 by 16–19 μ; wall light cinnamon-brown, 2–2.5 μ thick, closely verrucose-echinulate, the pores 4, sometimes 3, equatorial.

III. Telia hypophyllous, scattered, oval or oblong, about 0.1 mm. wide by 0.2–0.5 mm. long, sometimes crowded and confluent, early naked, pulvinate, dark chocolate-brown, ruptured epidermis somewhat noticeable; teliospores broadly ellipsoid, 13–16 by 19–29 μ, rounded or often narrowed below, rounded or more often truncate above; wall dark chestnut-brown, rather thin, 1.5–2 μ, thicker at apex, 5–10 μ, smooth; pedicel somewhat tinted, uniform in diameter, once to twice length of spore.

ON POACEAE:
Andropogon glomeratus (Walt.) B.S.P. (*A. macrourus* Michx.), Alabama, Delaware, Florida, Maryland, Mississippi, New Jersey, Tennessee.
Andropogon virginicus L., Alabama, Arkansas, Delaware, Florida, Kentucky, Louisiana, Maryland, Mississippi, North Carolina, Ohio, South Carolina, Tennessee, West Virginia.
TYPE LOCALITY: Bethlehem, Pennsylvania, on *Viola pedata*.
DISTRIBUTION: New Jersey to southern Ohio and Arkansas, southward to the coast.
EXSICCATI: Ellis & Ev. N. Am. Fungi *3138*, *3343*; Seym. & Earle, Econ. Fungi Suppl. *B1*; Barth. Fungi Columb. *2890*, *3088*.

3. **Nigredo Clignyi** (Pat. & Hariot) Arthur.

Uromyces Clignyi Pat. & Hariot, Jour. de Bot. 14 : 237. 1900.

O and I. Pycnia and aecia unknown.

II. Uredinia hypophyllous, scattered, oblong or linear, rather early naked, cinnamon-brown ; urediniospores globoid, large, 24–29 by 26–32 μ ; wall pale cinnamon-brown, 1.5–2 μ thick, moderately and rather closely echinulate, the pores numerous, 8–10, scattered.

III. Telia hypophyllous, oblong or oval to linear, 0.3–1 mm. long, scattered, rarely confluent, causing a slight discoloration, rather tardily naked, chocolate-brown, ruptured epidermis not conspicuous ; teliospores globoid, 22–31 μ in diameter ; wall chocolate-brown, thick, 3–5 μ, somewhat thicker above, 4–7 μ, smooth ; pedicel hyaline or slightly tinted, flexuous, as long as spore or longer.

ON POACEAE :
Andropogon hirtiflorus Kunth, Jalisco; Lower California, Mexico (state).
Andropogon Schottii Rupr., Chihuahua.
TYPE LOCALITY : Western Sudan, on a gráss of the tribe *Andropogoneae*.
DISTRIBUTION : Northern to central Mexico ; also in tropical Africa.

4. **Nigredo graminicola** (Burrill) Arth. Résult. Sci. Congr. Bot. Vienne 343. 1906.

Uromyces graminicola Burrill, Bot. Gaz. 9 : 188. 1884.
Uromyces Panici Tracy, Jour. Myc. 7 : 281. 1893.
Caeomurus graminicola Kuntze, Rev. Gen. 3^3 : 450. 1898.
Caeomurus Panici Kuntze, Rev. Gen. 3^3 : 450. 1898.
Nigredo Panici Arth. Résult. Sci. Congr. Bot. Vienne 344. 1906.

O and I. Pycnia and aecia unknown.

II. Uredinia chiefly hypophyllous, scattered, oblong or linear, small, 0.4–0.8 mm. long, rather early naked, pulverulent, cinnamon-brown, ruptured epidermis noticeable ; urediniospores subgloboid or obovoid, 15–19 by 18–23 μ ; wall pale cinnamon-brown, 2–2.5 μ thick, moderately verrucose-echinulate, the pores 3 or 4, approximately equatorial.

III. Telia amphigenous, scattered, sometimes crowded and confluent, linear, 0.5–2 mm. long, early naked, pulvinate, blackish-brown, ruptured epidermis rather conspicuous ; teliospores obovoid or broadly ellipsoid, often angular, 13–19 by 21–32 μ, usually narrowed below, rounded or obtuse above ; wall chestnut-brown, 1.5–2 μ thick, much thicker at apex, 3–9 μ, smooth ; pedicel slightly tinted, about twice length of spore.

ON POACEAE :
?*Panicum anceps* Michx. (*P. rostratum* Muhl.), Mississippi.
Panicum depauperatum Muhl., Missouri.
Panicum virgatum L., Florida, Illinois, Iowa, Kansas, Mississippi, Nebraska, North Carolina, Oklahoma, South Dakota.
TYPE LOCALITY : McLean County, Illinois, on *Panicum virgatum*.
DISTRIBUTION : Southern South Dakota and Illinois southward to Oklahoma and Florida.
ILLUSTRATION : Sydow, Monog. Ured. 2 : 335.
EXSICCATI : Carleton, Ured. Am. *1 ;* Kellerm. & Swingle, Kan. Fungi *48 ;* Sydow, Ured. *1155 ;* Arth. & Holway, Ured. Exs. Ic. *19a*, *b*, *c ;* Rab.-Wint. Fungi Eur. *3410 ;* Roum. Fungi Sel. *5125 ;* Vesterg. Micr. Rar. Sel. *1135 ;* D. Griff. W. Am. Fungi *88 ;* Barth. Fungi Columb. *3496 ;* Barth. N. Am. Ured. *190 ;* Ellis & Ev. N. Am. Fungi *1865*.

5. **Nigredo leptoderma** (Sydow) Arthur.

Uromyces leptodermus Sydow ; Sydow & Butler, Ann. Myc. 4 : 430. 1906.
Uredo Isachnes Sydow ; Sydow & Butler, Ann. Myc. 4 : 444. 1906.
Uredo Panici-prostrati Sydow ; Sydow & Butler, Ann. Myc. 4 : 444. 1906.
Puccinia (?) *panicicola* Arth. Bull. Torrey Club 34 : 586. 1908.

O and I. Pycnia and aecia unknown.

II. Uredinia amphigenous, scattered, oval, 0.1–0.3 mm. wide by 0.2–0.4 mm. long, soon naked, pulverulent, dark cinnamon brown, ruptured epidermis noticeable ; urediniospores broadly ellipsoid or obovoid, 23–25 by 26–30 μ ; wall dark cinnamon-brown, rather thin, 1.5 μ, closely and strongly echinulate-verrucose with blunt points, the pores usually 3 or 4, sometimes only 2, equatorial.

III. Telia amphigenous, scattered, very small and inconspicuous, punctiform, about 0.2–0.4 mm. long, subepidermal, blackish ; teliospores subgloboid or angular-globoid, 16–20

by 19–26 μ; wall cinnamon-brown, rather thin, 1–1.5 μ thick, uniform, smooth; pedicel hyaline, slender, about length of spore or less.

ON POACEAE:
Panicum barbinode Trin. (*P. molle* Auct. not Swartz), Florida; Cuba; Morelos; Guatemala.
TYPE LOCALITY: Dehra Dun, India, on *Panicum javanicum*.
DISTRIBUTION: Southern Florida and central Mexico southward; also in India.
EXSICCATI: Barth. Fungi Columb. *2671*.

6. **Nigredo major** Arthur.

Uromyces major Arth. Bull. Torrey Club 38: 377. 1911.

O and I. Pycnia and aecia unknown.

II. Uredinia amphigenous, scattered, oval or oblong, 0.1–0.2 mm. wide by 0.3–1 mm. long, soon naked, cinnamon-brown, somewhat pulverulent, ruptured epidermis noticeable; urediniospores broadly ellipsoid, 19–23 by 21–26 μ; wall light golden-yellow, moderately thick, 2–2.5 μ, strongly and evenly echinulate, the pores 4, equatorial.

III. Telia amphigenous, scattered, oval or oblong, about 0.1 mm. wide by 0.3–1 mm. long, early naked, pulvinate, blackish-brown, ruptured epidermis not noticeable; teliospores broadly ellipsoid or globoid, 19–23 by 23–27 μ, usually rounded both above and below; wall smooth, chestnut-brown, concolorous, moderately thick, 2–2.5 μ, the apex considerably thickened, 5–9 μ; pedicel firm, 5–7 μ in diameter, very slightly tinted, once to twice length of spore.

ON POACEAE:
Muhlenbergia sp., Mexico (state).
TYPE LOCALITY: Near City of Mexico, Mexico, on *Muhlenbergia* sp.
DISTRIBUTION: Known only from the type locality.

7. **Nigredo seditiosa** (Kern) Arthur.

Aecidium Plantaginis Burrill, Bull. Ill. Lab. Nat. Hist. 2: 232. 1885. Not *A. Plantaginis* Ces. 1858.
Uromyces Aristidae Auct. Not *U. Aristidae* Ellis & Ev. 1887.
Uromyces seditiosus Kern, Torreya 11: 212. 1911.

O. Pycnia amphigenous, few, on discolored spots 0.5–4 mm. across, inconspicuous, honey-yellow becoming brownish, subglobose, laterally compressed, 80–100 μ in diameter by 100–112 μ high; ostiolar filaments 45–65 μ long.

I. Aecia amphigenous, gregarious, in crowded or sometimes annular groups on discolored spots 0.5–4 mm. across, cupulate or short-cylindrical, 0.2–0.3 mm. in diameter; peridium colorless, the margin erose, erect or somewhat recurved; peridial cells rhombic in longitudinal section, 17–19 by 28–35 μ, the outer wall very thick, 10–13 μ, transversely striate, smooth, the inner wall thinner, 4–5 μ, somewhat striate, moderately verrucose; aeciospores subglobose or broadly ellipsoid, 14–18 by 16–22 μ; wall colorless, rather thin, 1.5 μ, finely verrucose.

ON PLANTAGINACEAE:
Plantago aristata Michx., Missouri, Nebraska, Texas.
Plantago eriopoda Torr., Montana, Wyoming.
Plantago Purshii R. & S., Nebraska, Texas.
Plantago Rugelii Decaisne, Missouri.
Plantago Tweedyi A. Gray, Montana, Wyoming.
Plantago virginica L., Alabama, Illinois, Mississippi, Missouri, South Carolina, Texas.

II. Uredinia epiphyllous, scattered, linear or oblong, cinnamon-brown, few seen; urediniospores globoid, 19–26 μ in diameter; wall cinnamon-brown, moderately thick, 2–2.5 μ, very minutely verrucose, appearing almost smooth when wet, the pores rather indistinct, 4, equatorial.

III. Telia epiphyllous, scattered or sometimes crowded and irregularly confluent, oblong or linear, 0.2–0.4 mm. wide by 0.5–1 mm. or more long, early naked, conspicuous, compact, pulvinate, dark chocolate-brown, ruptured epidermis not noticeable; teliospores broadly ellipsoid, or obovoid to nearly globoid, 15–21 by 23–39 μ, rounded or obtuse at both ends; wall chestnut-brown usually with a slightly paler umbo, about 1.5–2 μ thick, much thicker at the apex, 5–10 μ, smooth; pedicel slightly colored, rather stout, once to twice length of spore.

ON POACEAE:
Aristida basiramea Engelm., Kansas, Nebraska.
Aristida dichotoma Michx., Arkansas, Kansas, Kentucky.
Aristida oligantha Michx., Kansas, Texas.
Aristida purpurascens Poir., Alabama, Kentucky, New Jersey.
Aristida purpurea Nutt., Nebraska.
TYPE LOCALITY: Wakeeney, Kansas, on *Aristida oligantha*.
DISTRIBUTION: Montana south to Texas and Alabama, and from New Jersey south to South Carolina.
ILLUSTRATIONS: Bull. Lab. Nat. Hist. Univ. Iowa **5**: *pl. 1, f. 45a, b*.
EXSICCATI: Ellis & Ev. N. Am. Fungi *1829*; Ellis & Ev. Fungi Columb. *1469, 1475, 2181*; Carleton, Ured. Am. *26*; Barth. Fungi Columb. *2390, 2892*; Rav. Fungi Am. *483*; Vesterg. Micr. Rar. Sel. *1052a, b*; Arth. & Holway, Ured. Exs. Ic. *45a, b*.

8. **Nigredo minima** (Davis) Arth. Résult. Sci. Congr. Bot. Vienne 344. 1906.

Uromyces minimus Davis, Bot. Gaz. **19**: 415. 1894.
Caeomurus minimus Kuntze, Rev. Gen. **3**[3]: 450. 1898.

O and I. Pycnia and aecia unknown.

II. Uredinia hypophyllous, scattered, oval or oblong, small, early naked, cinnamon-brown, only few seen; urediniospores globoid or subgloboid, 13–20 by 15–22 μ; wall cinnamon-brown, 1.5–2 μ thick, strongly and sharply verrucose-echinulate, the pores 2–4, equatorial.

III. Telia hypophyllous, scattered, oblong or linear, about 0.1 mm. wide by 0.3–1 mm. long, early naked, dark chocolate-brown, pulvinate, ruptured epidermis not noticeable; teliospores globoid or obovoid, 12–19 by 14–23 μ; wall dark chestnut-brown, with a slightly paler umbo, rather thin, 1–1.5 μ, the apex very much thickened, 5–9 μ, smooth; pedicel moderately stout, firm, slightly colored, about length of spore.

ON POACEAE:
Muhlenbergia comata (Thurb.) Benth., Oregon.
Muhlenbergia racemosa (Michx.) B.S.P. (*M. glomerata* Trin.), Oregon.
Muhlenbergia sylvatica Torr., Wisconsin.
TYPE LOCALITY: Kenosha County, Wisconsin, on *Muhlenbergia sylvatica*.
DISTRIBUTION: Wisconsin and northern Oregon.
ILLUSTRATIONS: Bull. Lab. Nat. Hist. Univ. Iowa **5**: *pl. 1, f. 48a*.
EXSICCATI: Ellis & Ev. N. Am. Fungi *1811, 3240*; Rab.-Wint.-Paz. Fungi Eur. *3833a*; Arth. & Holway, Ured. Exs. Ic. *48a*.

9. **Nigredo Halstedii** (De-Toni) Arthur.

Uromyces digitatus Halsted, Jour. Myc. **3**: 138. 1887. Not *U. digitatus* Wint. 1886.
Uromyces Halstedii De-Toni, in Sacc. Syll. Fung. **7**: 557. 1888.
Uromyces Halstedii Ludw. Bot. Centr. **37**: 120. 1889.
Caeomurus Halstedii Kuntze, Rev. Gen. **3**[3]: 450. 1898.
Nigredo digitata Arth. Résult. Sci. Congr. Bot. Vienne 343. 1906.

O and I. Pycnia and aecia unknown.

II. Uredinia hypophyllous, scattered, small, linear or oblong, 0.2–0.5 mm. long, rather tardily naked, somewhat pulverulent, cinnamon-brown, ruptured epidermis noticeable; paraphyses intermixed with the spores, mostly capitate, 12–21 by 36–56 μ, the wall nearly or quite colorless, thin, about 1 μ or less, slightly thicker above, smooth; urediniospores ellipsoid or obovoid, 15–21 by 21–28 μ; wall cinnamon-brown, thin, 1–1.5 μ, evenly and rather finely echinulate, the pores 3 or 4, equatorial.

III. Telia chiefly hypophyllous, scattered, oblong or linear, 0.1–0.2 mm. wide by 0.5–1.5 mm. long, rather tardily naked, pulvinate, very dark blackish-brown, ruptured epidermis conspicuous; teliospores broadly cuneiform, 15–23 by 19–27 μ; wall dark chestnut-brown, paler below, rather thin at the sides, 1–1.5 μ, smooth, the apex greatly thickened and covered with numerous digitate projections 3–5 μ long; pedicel tinted, slender, about as long as the spore.

ON POACEAE:
Homalocenchrus oryzoides (L.) Poll. (*Phalaris oryzoides* L., *Leersia oryzoides* Sw.), Delaware, South Dakota.
Homalocenchrus virginicus (Willd.) Britton (*Leersia virginica* Willd.), Alabama, Iowa, Louisiana, Wisconsin.
TYPE LOCALITY: Ames, Iowa, on *Leersia virginica*.
DISTRIBUTION: South Dakota and Delaware southward to Alabama and Louisiana.
ILLUSTRATIONS: Bull. Lab. Nat. Hist. Univ. Iowa **3**: *pl. 4, f. 43a*.
EXSICCATI: Ellis & Ev. N. Am. Fungi *2227*; D. Griff. W. Am. Fungi *50*; Arth. & Holway, Ured. Exs. Ic. *43a*.

10. **Nigredo Sporoboli** (Ellis & Ev.) Arth. Résult. Sci. Congr. Bot. Vienne 344. 1906.

Uromyces Sporoboli Ellis & Ev. Proc. Acad. Phila. **1893**: 155. 1893.
Caeomurus Sporoboli Kuntze, Rev. Gen. 3³: 450. 1898.

O and I. Pycnia and aecia unknown.

II. Uredinia hypophyllous, scattered, oblong or linear, cinnamon-brown, only a few seen; urediniospores broadly ellipsoid, 26–31 by 42–45 μ; wall pale cinnamon-brown, about 1.5–2 μ thick, prominently echinulate, the pores distinct, 4, equatorial.

III. Telia hypophyllous, scattered, oblong or linear, 0.5–1.5 mm. long, sometimes confluent, rather early naked, pulvinate, blackish-brown, ruptured epidermis conspicuous; teliospores obovate, oblong, or subglobose, 19–23 by 25–43 μ, rounded or obtuse above, usually narrowed below; wall dark chestnut-brown with a slightly paler umbo, 1.5–2.5 μ thick, much thickened above, 6–9 μ, smooth; pedicel concolorous or nearly so, once to twice length of spore or more.

ON POACEAE:
Sporobolus asper (Michx.) Kunth (*S. longifolius* Wood), Kansas.
Sporobolus cryptandrus (Torr.) A. Gray, South Dakota.
Sporobolus neglectus Nash, Iowa, Kansas, Nebraska, South Dakota.
TYPE LOCALITY: Rockport, Kansas, on *Sporobolus asper*.
DISTRIBUTION: South Dakota and northwestern Iowa south to Kansas.
EXSICCATI: Ellis & Ev. N. Am. Fungi *2884*; Ellis & Ev. Fungi Columb. *1599*; D. Griff. W. Am. Fungi *91, 256*; Barth. Fungi Columb. *3396*.

11. **Nigredo Eragrostidis** (Tracy) Arth. Résult. Sci. Congr. Bot. Vienne 343. 1906.

Uromyces Eragrostidis Tracy, Jour. Myc. **7**: 281. 1893.
Caeomurus Eragrostidis Kuntze, Rev. Gen. 3³: 450. 1898.

O and I. Pycnia and aecia unknown.

II. Uredinia amphigenous, scattered, oval or oblong, 0.3–0.8 mm. long, rather early naked, very light cinnamon-brown, pulverulent, ruptured epidermis conspicuous; urediniospores broadly ellipsoid, 15–19 by 20–26 μ; wall pale cinnamon-brown, thin, 1–1.5 μ, rather finely and closely verrucose-echinulate, the pores 4–6, scattered, rather distinct.

III. Telia chiefly epiphyllous, scattered, oblong, oval, or linear, 0.2–0.4 mm. wide by 0.3–1.5 mm. or more long, early naked, pulvinate, dark blackish-brown, ruptured epidermis conspicuous; teliospores obovoid or subgloboid, 16–23 by 19–27 μ; wall dark chestnut-brown, concolorous, moderately thin, 1.5–2.5 μ, much thicker above, 5–7 μ, smooth; pedicel colored, especially next the spore, firm, about as long as the spore.

ON POACEAE:
Eragrostis limbata Fourn., Jalisco, Pueblo.
Eragrostis neo-mexicana Vasey, Guanajuato, Hidalgo.
Eragrostis pectinacea (Michx.) Steud., Alabama, Mississippi, Nebraska, Texas.
Eragrostis pilosa (L.) Beauv., Durango, Morelos.
Eragrostis tephrosanthus Schult., Porto Rico.
TYPE LOCALITY: Starkville, Mississippi, on *Eragrostis pectinacea*.
DISTRIBUTION: Nebraska to northern Alabama and southward through the West Indies and Mexico.
EXSICCATI: Seym. & Earle, Econ. Fungi *537*.

12. **Nigredo Alopecuri** (Seym.) Arth. Résult. Sci. Congr. Bot. Vienne 343. 1906.

Uromyces Alopecuri Seym. Proc. Bost. Soc. Nat. Hist. 24: 186. 1889.
Caeomurus Alopecuri Kuntze, Rev. Gen. 3³: 449. 1898.

O and I. Pycnia and aecia unknown.

II. Uredinia chiefly hypophyllous, scattered, linear or linear-lanceolate, 0.5–1 mm. long, rather early naked, somewhat pulverulent, pale-brown, ruptured epidermis noticeable; urediniospores subglobose or obovate-ellipsoid, 15–21 by 18–26 μ; wall yellowish, 1.5–2 μ thick, finely and rather closely verrucose-echinulate, the pores 6–8, scattered.

III. Telia hypophyllous, also on the sheaths and culms, scattered, oblong, linear, or sometimes punctiform, 0.2–0.8 mm. long, sometimes crowded end to end and more or less

confluent, long covered by the epidermis, grayish-black; teliospores broadly cuneiform or subpyriform, 15–20 by 19–27 μ, the apex rounded or truncate, the base usually narrowed, sometimes rounded; wall golden-brown, somewhat darker above, 1.5–2 μ thick, slightly thicker above, 2–3 μ, smooth; pedicel slender, colored, about length of spore or shorter.

ON POACEAE:
Alopecurus aristulatus Michx. (*A. fulvus* Smith, *A. geniculatus aristulatus* Torr.), Colorado, Minnesota, Nebraska, Wyoming.
TYPE LOCALITY: Brainerd, Minnesota, on *Alopecurus geniculatus* "*aristata*," error for *A. gen. aristulatus*.
DISTRIBUTION: Northern Minnesota to eastern Wyoming and southward to Colorado.
ILLUSTRATION: Bull. Lab. Nat. Hist. Univ. Iowa **4**: *pl. 4, f. 18*.
EXSICCATI: Barth. Fungi Columb. *2289, 2389*; D. Griff. W. Am. Fungi *282*; Arth. & Holway, Ured. Exs. Ic. *18a, b*.

13. **Nigredo amphidyma** (Sydow) Arthur.

Uromyces amphidymus Sydow, Ann. Myc. **4**: 29. 1906.
Uromyces Glyceriae Arth. Bull. Torrey Club **37**: 572. 1910.

O and I. Pycnia and aecia unknown.

II. Uredinia amphigenous, intercostal, scattered, oval or lens-shaped, small, 0.2–0.4 mm. long, soon naked, pulverulent, brownish-yellow, ruptured epidermis usually inconspicuous; urediniospores broadly ellipsoid or globoid, 16–21 by 18–26 μ; wall pale golden-yellow, 1.5–2 μ thick, finely and evenly verrucose-echinulate, the pores 6–8, scattered, distinct.

III. Telia amphigenous, intercostal, scattered, oval or lens-shaped, small, 0.2–0.4 mm. long, tardily naked, pulverulent, dark chestnut-brown, epidermis rupturing by longitudinal slits, conspicuous; teliospores ellipsoid or obovoid, 14–19 by 21–34 μ, rounded, truncate, or obtuse above, usually narrowed below; wall smooth, cinnamon-brown, often paler below, rather thin, 1–1.5 μ, the apex much thicker, 3–7 μ; pedicel slender, tinted, about length of spore.

ON POACEAE:
Panicularia septentrionalis (Hitchc.) Bicknell (*Glyceria fluitans* A. Gray, not R. Br., *G. septentrionalis* Hitchc.), Illinois, Indiana, Wisconsin.
Panicularia acutiflora (Torr.) Kuntze (*Glyceria acutiflora* Torr.), Rhode Island.
TYPE LOCALITY: Oregon, Illinois, on *Glyceria fluitans*, later determined to be *G. septentrionalis*.
DISTRIBUTION: Central Atlantic coast, and from Indiana and Illinois northward.
EXSICCATI: Ellis & Ev. N. Am. Fungi *2718*.

14. **Nigredo Hordei** (Tracy) Arthur.

Uromyces Hordei Tracy, Jour. Myc. **7**: 281. 1893.
Caeomurus Hordei Kuntze, Rev. Gen. 3^3: 450. 1898.

O and I. Pycnia and aecia unknown.

II. Uredinia chiefly epiphyllous, scattered, oblong or linear, 0.5–1 mm. long, rather early naked, pulverulent, cinnamon-brown, ruptured epidermis conspicuous; urediniospores broadly ellipsoid, 16–24 by 22–29 μ; wall yellowish, 1.5–2 μ thick, finely and closely verrucose-echinulate, the pores 8–10, scattered, rather obscure.

III. Telia chiefly hypophyllous, scattered, oval or oblong, 0.2–1 mm. long, long covered by the epidermis, dark grayish-black; teliospores angular-obovoid or cuneiform, 15–25 by 26–32 μ, rounded or angular at apex, usually narrowed below; wall chestnut-brown, moderately thin, 1.5–2 μ, thicker at apex, 3–6 μ, smooth; pedicel nearly or quite colorless, slender, about length of spore or shorter.

ON POACEAE:
Festuca octoflora Walt. (*F. tenella* Willd.), Mississippi, Texas.
Hordeum nodosum L. (*H. pratense* Huds.), California.
Hordeum pusillum Nutt., Kansas, Louisiana, Nebraska, Texas.
TYPE LOCALITY: New Orleans, Louisiana, on *Hordeum* "*pratense*," error for *H. pusillum*.
DISTRIBUTION: Nebraska to Mississippi and Texas, and the coast of central California.
EXSICCATI: Ellis & Ev. Fungi Columb. *1796, 1895*; Sydow, Ured. *1803, 1804*; Seym. & Earle, Econ. Fungi *538*.

15. **Nigredo mystica** Arthur.

Uromyces mysticus Arth. Bull. Torrey Club **38**: 377. 1911.

O and I. Pycnia and aecia unknown.

II. Uredinia chiefly epiphyllous, scattered, oblong or linear, 0.5–1.2 mm. long, rather early naked, pulverulent, golden-brown, ruptured epidermis conspicuous; urediniospores broadly ellipsoid, 24–28 by 27–32 μ; wall golden-yellow, moderately thick, 2–2.5 μ, finely and inconspicuously echinulate, the pores 8–12, scattered.

III. Telia chiefly hypophyllous, scattered, 0.2–1 mm. long, long covered by the epidermis, grayish-black; teliospores angularly obovoid, 18–26 by 26–33 μ, rounded or angular above, rounded or somewhat narrowed below; wall chestnut-brown, moderately and uniformly thick, 2–2 5 μ, finely and inconspicuously verrucose; pedicel light-yellow, one half to once length of spore.

ON POACEAE:
Hordeum jubatum L., Colorado, Utah.
TYPE LOCALITY: Denver, Colorado, on *Hordeum jubatum*.
DISTRIBUTION: Central Rocky Mountains.
EXSICCATI: Barth. Fungi Columb. *3497;* Barth. N. Am. Ured. *91*.

16. **Nigredo Poae** (Rab.) Arthur.

Uromyces Poae Rab. (Unio Itin. Crypt. *38*. 1866); Schröt. Beitr. Biol. Pfl. **3**: 64. 1879.

O. Pycnia epiphyllous, in small groups 1 mm. or less across, honey-yellow becoming brownish, globoid, 98–144 μ in diameter by 90–128 μ high; ostiolar filaments not seen.

I. Aecia hypophyllous, gregarious, in crowded groups 1.5–2.5 mm. across, cupulate, short, 0.2–0.4 mm. in diameter; peridium whitish, the margin spreading or slightly recurved, finely lacerate; peridial cells rhombic or rhomboidal, 26–33 μ long, the outer wall thick, 7–9 μ, striate, the inner wall thinner, 3–4 μ, moderately verrucose; aeciospores subgloboid, 15-18 by 16–22 μ; wall yellowish or colorless, thin, about 1 μ, finely verrucose.

ON RANUNCULACEAE:
Ranunculus repens L., Nova Scotia.

II. Uredinia amphigenous, scattered, small, oval or linear, rather tardily naked; urediniospores broadly ellipsoid or obovoid, 16–20 by 21–26 μ; wall yellowish, thin, about 1.5 μ, finely echinulate, the pores 3–5, scattered.

III. Telia amphigenous, scattered, small, oval or linear, brownish-black, tardily naked; teliospores ellipsoid or obovate-ellipsoid, 15–19 by 24–29 μ, rounded or truncate at the apex; wall light golden-brown above, lighter below, thin, 1–1.5 μ, somewhat thicker above, smooth; pedicel colorless, as long as the spore or less.

The species is composed of a number of races brought to light by cultures (*cf.* Kleb. Wirtsw. Rostp. 324. 1904), some of which have received independent names. The somewhat uncertain synonymy, which applies chiefly to European forms, is not given. *Uromyces Dactylidis* Otth, not yet found in America, is considered distinct from *U. Poae* (*cf.* Juel, Sv. Bot. Tidssk. 2: 169. 1908).

ON POACEAE:
Poa trivialis L., Nova Scotia.
TYPE LOCALITY: Germany, on *Poa nemoralis*.
DISTRIBUTION: Nova Scotia; also in Europe.
ILLUSTRATION: Beitr. Krypt. Schweiz 2^2: *f. 55*.

17. **Nigredo Epicampis** (Dietel & Holway) Arth. Résult. Sci. Congr. Bot. Vienne 343. 1906.

Uromyces Epicampus Dietel & Holway; Holway, Bot. Gaz. **24**: 23. 1897.

O and I. Pycnia and aecia unknown.

II. Uredinia epiphyllous, intercostal, early naked, cinnamon-brown; urediniospores globoid, 28–32 μ in diameter; wall 1.5–2 μ thick, cinnamon-brown, closely echinulate, the pores 5 or 6, scattered.

III. Telia epiphyllous, intercostal, oblong or linear, 0.5–1 mm. long, early naked, blackish-brown; teliospores globoid or broadly obovate, 20–26 by 26–35 μ, rounded or obtuse at both ends; wall chestnut-brown, rather thin, 1.5 μ, thicker at apex, 5–7 μ; pedicel firm, tinted next to spore, two to three times length of spore.

ON POACEAE:
Epicampes macroura Benth., Mexico (state).
TYPE LOCALITY: Eslava, near City of Mexico, Mexico, on *Epicampes macroura*.
DISTRIBUTION: Central Mexico.
ILLUSTRATION: Bull. Lab. Nat. Hist. Univ. Iowa **5**: *pl. 1, f. 47a*.
EXSICCATI: Arth. & Holway, Ured. Exs. Ic. *47a*.

18. **Nigredo Aegopogonis** (Dietel & Holway) Arth. Résult. Sci. Congr. Bot. Vienne 343. 1906.

Uromyces Aegopogonis Dietel & Holway ; Holway, Bot. Gaz. **24**: 25. 1897.

O and I. Pycnia and aecia unknown.

II. Uredinia hypophyllous, rarely epiphyllous, scattered, oblong or linear, 0.5–0.8 mm. long, early naked, somewhat pulverulent, light cinnamon-brown, ruptured epidermis noticeable ; urediniospores globoid or obovoid, 16–19 by 19–23 μ ; wall light cinnamon-brown, moderately thin, 1.5–2 μ, moderately echinulate, the pores 6–8, scattered.

III. Telia hypophyllous, scattered, oblong-ellipsoid or somewhat linear, 0.4–1 mm. long, soon naked, pulvinate, blackish-brown, ruptured epidermis not noticeable ; teliospores globoid, 19–26 μ in diameter, rounded above and below ; wall chestnut-brown, slightly darker above, rather thin, about 1.5 μ, thicker at apex, 5–7 μ, smooth ; pedicel slightly tinted, firm, about once to once and a half length of spore.

ON POACEAE :
Aegopogon cenchroides H.B.K., Mexico (state).
Aegopogon geminiflorus H.B.K., Mexico (state), Morelos.
Aegopogon gracilis Vasey, Mexico (state).
Paspalum velutinum Kunth, Michoacan.
TYPE LOCALITY : Near City of Mexico, Mexico, on *Aegopogon cenchroides*.
DISTRIBUTION : Central Mexico.

19. **Nigredo Peckiana** (Farl.) Arth. Résult. Sci. Congr. Bot. Vienne 344. 1906.

Uromyces Peckianus Farl. Proc. Am. Acad. 18 : 78. 1883.
Caeomurus Peckianus Kuntze, Rev. Gen. 3[3] : 450. 1898.

O. Pycnia amphigenous, gregarious, usually in roundish groups 0.5–1.5 mm. across, punctiform, honey-yellow becoming brownish, globoid, 100–135 μ in diameter ; ostiolar filaments 30–65 μ long.

I. Aecia amphigenous, gregarious or sometimes solitary, rather loosely arranged in groups 1.5–2.5 mm. across, cylindrical, often rather long, 0.2–0.3 mm. in diameter ; peridium yellowish or whitish, rather tardily dehiscent at apex, the margin erect or spreading, irregularly lacerate; peridial cells rhombic or rhomboidal, 24–28 μ long, the outer wall thick, 6–9 μ, striate, the inner wall thinner, 2–3 μ, verrucose ; aeciospores globoid, 14–20 by 18–23 μ ; wall thin, about 1 μ, evenly and finely verrucose.

ON CHENOPODIACEAE :
Atriplex patula L., Nova Scotia.
Chenopodium album L., Nova Scotia.
Dondia maritima (L.) Druce (*Sueda maritima* Dumort.), Nova Scotia.
Salicornia ambigua Michx., Washington.
Salicornia herbacea L., Nova Scotia.

II. Uredinia epiphyllous, scattered, oblong or linear, 0.4–1 mm. long, early naked, pulverulent, cinnamon-brown, ruptured epidermis noticeable; urediniospores broadly ellipsoid or globoid, 16–23 by 18–26 μ ; wall pale cinnamon-brown, rather thick, 2–2.5 μ, finely and evenly verrucose, the pores about 6, scattered.

III. Telia amphigenous, scattered, oval or oblong, 0.1–0.3 mm. wide by 0.3–0.8 mm. long, early naked, pulvinate, blackish-brown, ruptured epidermis not conspicuous; teliospores obovoid or ellipsoid, 16–21 by 24–35 μ, rounded or obtuse above, often narrowed below; wall chestnut-brown or lighter, concolorous, 2–2.5 μ thick, usually somewhat thicker above, 4–9 μ, smooth ; pedicel slightly tinted, about once to twice length of spore.

ON POACEAE :
Distichlis spicata (L.) Greene (*D. maritima* Raf., *Brizopyrum spicatum* Hook.), California, Florida, Massachusetts, New Jersey, New York, Washington ; Nova Scotia.
TYPE LOCALITY : Gloucester, Massachusetts, on *Brizopyrum spicatum*.
DISTRIBUTION : Saline soil along the Atlantic and Pacific coasts.
EXSICCATI : Ellis, N. Am. Fungi *240;* Rab.-Wint. Fungi Eur. *3411;* Sydow, Ured. *1805;* Barth. Fungi Columb. *3195*.

20. **Nigredo Polemonii** (Peck) Arthur.

Aecidium Polemonii Peck, Bot. Gaz. 4 : 230. 1879.
Uromyces acuminatus Arth. Bull. Minn. Acad. 2^2 : 35. 1883.
Uromyces Spartinae Farl. Proc. Am. Acad. 18 : 77. 1883.
?*Aecidium Tissae* Ellis & Ev. Bull. Torrey Club 24 : 284. 1897.
Caeomurus acuminatus Kuntze, Rev. Gen. 3^3 : 449. 1898.
Caeomurus Spartinae Kuntze, Rev. Gen. 3^3 : 450. 1898.
Nigredo acuminata Arth. Résult. Sci. Congr. Bot. Vienne 343. 1906.

O. Pycnia chiefly epiphyllous, gregarious, in small groups 0.5–1.5 mm. across, not conspicuous, punctiform, honey-yellow becoming brownish, globoid, 80–160 μ in diameter by 70–150 μ high ; ostiolar filaments 30–50 μ long.

I. Aecia chiefly hypophyllous, gregarious, more or less crowded in groups 1–4 mm. across, on slightly discolored spots, cupulate, short, 0.2–0.4 mm. in diameter ; peridium colorless, the margin irregularly lacerate, slightly recurved ; peridial cells rhomboidal, 21–29 μ long, the outer wall transversely striate, 4–7 μ thick, smooth, the inner wall rather finely verrucose, 2–4 μ thick ; aeciospores subgloboid, 15–24 by 18–27 μ ; wall colorless, 1.5–2 μ, evenly and finely verrucose.

ON CARYOPHYLLACEAE :
Arenaria lateriflora L., Nova Scotia.
Tissa canadensis (Pers.) Britton (*Spergularia canadensis* G. Don), Nova Scotia.
?*Tissa macrotheca* (Hornem.) Britton (*Spergularia macrotheca* Heynh.), California.
ON PRIMULACEAE :
Steironema ciliatum (L.) Raf. (*Lysimachia ciliata* L.), Colorado, Illinois, Iowa, Kansas, Nebraska, South Dakota, Wyoming.
Steironema Lunellii Greene, North Dakota.
ON POLEMONIACEAE :
Collomia linearis Nutt., Colorado, Nebraska, North Dakota.
Phlox divaricata L., Iowa.
Phlox paniculata L., Iowa.
Phlox pilosa L., South Dakota, Wisconsin.
Polemonium reptans L., Indiana, Iowa.

II. Uredinia epiphyllous, scattered, intercostal, linear, 0.4–2 mm. or more long, rather early naked, pulverulent, cinnamon-brown, ruptured epidermis conspicuous ; urediniospores broadly ellipsoid, 19–27 by 25–37 μ ; wall light cinnamon-brown, moderately thick, 2–3 μ, evenly and moderately echinulate, the pores about 8, scattered.

III. Telia epiphyllous, scattered, intercostal, linear, 0.4–2 mm. or more long, rather early naked, dark blackish-brown, ruptured epidermis conspicuous ; teliospores obovoid, oblong-obovoid or ellipsoid, 15–24 by 23–39 μ, rounded, obtuse, or acuminate above, usually narrowed below ; wall chestnut-brown, sometimes with a slightly paler umbo, often somewhat paler below, rather thin, 1–1.5 μ, much thicker above, 5–12 μ, smooth ; pedicel somewhat colored, concolorous, about length of spore.

The species is composed of quite distinct races, partly made evident by cultures and partly indicated by slight morphological characters. It has been found that the Atlantic coast form on *Spartina patens* infects *Tissa* while that on *S. Michauxiana* infects *Arenaria*. A form on *S. Michauxiana* in the interior of the continent, usually with acuminate teliospores, infects *Polemonium*, while a more common form of the interior on the same host, and also on *S. gracilis*, usually with teliospores rounded above, infects *Steironema*.

ON POACEAE :
Spartina glabra alterniflora (Loisel.) Merr. (*S. alterniflora* Loisel., *S. stricta alterniflora* A. Gray), Delaware, Florida, Massachusetts, New York ; Nova Scotia.
Spartina gracilis Trin., North Dakota, Wyoming ; Alberta.
Spartina Michauxiana Hitchc. (*S. cynosuroides* A. Gray, not Roth), Colorado, Illinois, Indiana, Iowa, Nebraska, North Dakota, Wisconsin ; Nova Scotia.
Spartina patens (Ait.) Muhl., Maine ; Nova Scotia.
Spartina patens juncea (Michx.) Hitchc. (*S. juncea* Willd.), Massachusetts.

TYPE LOCALITY : Iowa, on *Polemonium reptans*.

DISTRIBUTION : Plains, Alberta to Kansas eastward to Wisconsin and Indiana, and along the Atlantic coast from Nova Scotia to Florida, possibly also along the Pacific coast.

ILLUSTRATIONS : Bot. Gaz. 34 : 5, *f. 1a, b, c, d, e ;* Bull. Lab. Nat. Hist. Univ. Iowa 5 : *pl. 4, f. 52a, b, c, d.*

EXSICCATI : Ellis, N. Am. Fungi *239, 1008, 1424, 1443 ;* Seym. & Earle, Econ. Fungi *67, 68, 546* ; Sydow, Ured. *251 ;* Rab.-Wint. Fungi Eur. *3623, 3637 ;* D. Griff. W. Am. Fungi *76, 358 ;* Barth. Fungi Columb. *2288, 2490, 2605 ;* Brenckle, Fungi Dak. *70, 102, 134 ;* Arth. & Holway, Ured. Exs. Ic. *52a, b, c, d.*

21. **Nigredo arguta** (Kern) Arthur.

Uromyces argutus Kern, Torreya 11 : 214. 1911.

O and I. Pycnia and aecia unknown.

II. Uredinia amphigenous, numerous, scattered, on rather large brownish or purplish spots, usually solitary, linear, 1–4 mm. long, rather tardily naked, slightly pulverulent, cinnamon-brown, ruptured epidermis noticeable; urediniospores broadly ellipsoid, 19–23 by 25–32 μ; wall rather thick, 2–3 μ, light cinnamon-brown, closely and very inconspicuously echinulate, the pores usually 3, occasionally 4, approximately equatorial, rather distinct.

III. Telia amphigenous, scattered, solitary, sometimes on discolored spots, linear, 1–2 mm. long, rather tardily naked, pulvinate, blackish, ruptured epidermis noticeable; teliospores ellipsoid or obovoid, 16–19 by 24–32 μ, usually narrowed both above and below; wall dark chestnut-brown, 1.5–2 μ thick, much thickened at apex, 7–10 μ, smooth; pedicel tinted next to the spore, about twice length of spore.

ON POACEAE:
Spartina glabra Muhl., Florida.
TYPE LOCALITY: Miami, Florida, on *Spartina glabra*.
DISTRIBUTION: Known only from the type locality.

22. **Nigredo Eleocharidis** Arthur.

Uromyces Eleocharidis Arth. Bull. Torrey Club 33: 514. 1906.

O and I. Pycnia and aecia unknown.

II. Uredinia amphigenous, scattered, oblong, 0.3–1.5 mm. long, tardily dehiscent by one or more longitudinal slits, dark cinnamon-brown; urediniospores ellipsoid to broadly ellipsoid, 15–19 by 19–29 μ; wall golden-yellow, thin, 1–1.5 μ, sparsely and finely echinulate, the pores 2, approximately equatorial.

III. Telia amphigenous, thickly scattered, oblong, 0.5–2 mm. or more long, tardily dehiscent by longitudinal slits, chocolate-brown; teliospores angularly obovoid, truncate or rounded above, narrowed below, 16–22 by 27–45 μ; wall light chestnut-brown, rather thin, 1–1.5 μ, thicker above, 7–10 μ, smooth; pedicel tinted, about once to once and a half length of spore.

ON CYPERACEAE:
Eleocharis palustris (L.) R. & S. (*E. glaucescens* Schult.), Iowa, Kansas, Nebraska, North Dakota, South Dakota, Wisconsin.
TYPE LOCALITY: Aberdeen, South Dakota, on *Eleocharis palustris*.
DISTRIBUTION: Northern Mississippi and Missouri basins.
EXSICCATI: D. Griff. W. Am. Fungi *60*, *60a*; Barth. Fungi Columb. *2293*, *3291*; Sydow, Ured. *2102*, *2252*; Brenckle, Fungi Dak. *50*.

23. **Nigredo Rhyncosporae** (Ellis) Arth. Résult. Sci. Congr. Bot. Vienne 344. 1906.

Uromyces Rhyncosporae Ellis, Jour. Myc. 7: 274. 1893.
Uromyces Rhyncosporae P. Henn. Hedwigia 35: 226. 1896.
Caeomurus Rhyncosporae Kuntze, Rev. Gen. 3³: 450. 1898.

O and I. Pycnia and aecia unknown.

II. Uredinia hypophyllous, scattered, oval or oblong, small, 0.2–0.5 mm. long, very tardily naked, slightly pulverulent, chestnut-brown, ruptured epidermis conspicuous; urediniospores ellipsoid or obovoid, 13–19 by 18–26 μ; wall golden-brown, thin, 1–1.5 μ, rather finely verrucose-echinulate, the pores 2, approximately equatorial.

III. Telia hypophyllous, scattered, frequently crowded and somewhat confluent, oblong or suborbicular, 0.1–0.4 by 0.5–1 mm. across, rather early naked, pulvinate, blackish-brown, ruptured epidermis evident; teliospores ellipsoid, cuneiform or clavate, 10–15 by 20–29 μ, rounded, truncate, or acuminate at apex, usually narrowed below; wall chestnut-brown or lighter, sometimes paler below, thin, 1–1.5 μ, thicker at apex, 5–9 μ, smooth; pedicel colored, about length of spore.

ON CYPERACEAE:
Rynchospora alba (L.) Vahl, Indiana, New Jersey, Rhode Island, Vermont; Ontario.
Rynchospora alba macra Clarke, Florida.
Rynchospora aurea Vahl, Porto Rico.

Rynchospora axillaris (Lam.) Britton (*R. cephalantha* A. Gray), Delaware, District of Columbia.
Rynchospora corniculata (Lam.) A. Gray, Alabama, Florida, Louisiana, Missouri.
Rynchospora cyperoides (Sw.) Mart., Bahamas.
Rynchospora distans (Michx.) Vahl, Florida, Mississippi; Cuba; Bermuda.
Rynchospora fascicularis (Michx.) Vahl, Florida, Mississippi.
Rynchospora glomerata (L.) Vahl, Alabama, Delaware, Massachusetts, New Jersey, Ohio, West Virginia.
Rynchospora glomerata paniculata (A. Gray) Chapm., Alabama, Mississippi, South Carolina.
Rynchospora micrantha Vahl, Porto Rico.
Rynchospora microcarpa Baldw., Florida.
Rynchospora perplexa Britton, Florida.
Rynchospora polyphylla Vahl, Jamaica.

TYPE LOCALITY: Pennsville, New Jersey, on *Rynchospora glomerata*.
DISTRIBUTION: Vermont and southern Ontario south to Louisiana and Florida, and in Bermuda and the West Indies.
EXSICCATI: Barth. Fungi Columb. *2397*; Barth. N. Am. Ured. *98*.

24. **Nigredo Scleriae** (P. Henn.) Arth. Résult. Sci. Congr. Bot. Vienne 344. 1906.

Uromyces Scleriae P. Henn. Hedwigia Beibl. **38**: 67. 1899.

O and I. Pycnia and aecia unknown.

II. Uredinia hypophyllous, oblong, 0.2–0.5 mm. long, long covered by the epidermis, finally pulverulent, cinnamon-brown; urediniospores obovoid or ovoid, 18–26 by 23–35 μ; wall 1.5–2.5 μ thick, thicker at apex, 3–9 μ, rather sparsely echinulate with conical papillae, the pores 3, approximately equatorial, obscure.

III. Telia hypophyllous, oblong, tardily naked, chestnut-brown; teliospores broadly ellipsoid or obovoid, 18–24 by 22–38 μ, rounded above, obtuse or narrowed below; wall chestnut-brown, moderately thick, 2–3 μ, thicker at apex, 4–8 μ, smooth; pedicel short, nearly or quite colorless.

ON CYPERACEAE:
Scleria pterota Presl, Porto Rico.
TYPE LOCALITY: Rio de Janeiro, Brazil, on *Scleria* sp.
DISTRIBUTION: Porto Rico; also in South America.

25. **Nigredo Scirpi** (Cast.) Arth. Résult. Sci. Congr. Bot. Vienne 344. 1906.

Uredo Scirpi Cast. Cat. Pl. Mars. 214. 1845.
Aecidium Glaucis Dozy & Molk. Tijds. Nat. Gesch. **12**: 286. 1845.
Puccinia lineolata Desmaz. Ann. Sci. Nat. III. **11**: 273. 1849.
Uromyces lineolatus Schröt.; Rab. Fungi Eur. *2077*. 1876.
Aecidium Sii-latifolii Wint. in Rab. Krypt. Fl. 1^1: 265. 1881.
Uromyces Scirpi Burrill, Bot. Gaz. **9**: 188. 1884.
Uromyces maritimus Plowr. Gard. Chron. III. **7**: 746. 1890.
Uromyces Burrilli Lagerh. Tromö Mus. Aarsh. **17**: 41. 1895.
Caeomurus lineolatus Kuntze, Rev. Gen. 3^3: 450. 1898.
Caeomurus Scirpi Kuntze, Rev. Gen. 3^3: 450. 1898.
Uromyces Aecidii-Glaucis Liro, Bidr. Finl. Nat. Folk **65**: 69. 1908.

O. Pycnia amphigenous, numerous, scattered, inconspicuous, subepidermal, golden-yellow becoming blackish-brown, globose, 65–100 μ in diameter; ostiolar filaments 65 μ long.

I. Aecia amphigenous, gregarious, on discolored, somewhat hypertrophied spots 2–5 mm. across which are often adjacent and confluent, short-cylindrical, 0.1–0.3 mm. in diameter by 1–1.5 mm. high; peridium pale-yellow or whitish, the margin lacerate, recurved; peridial cells overlapping, 22–26 μ long, somewhat longer than broad, the walls transversely striate, the outer 4–5 μ thick, the inner slightly thinner; aeciospores globoid or broadly ellipsoid, 16–21 by 18–24 μ; wall colorless, about 1 μ thick, minutely verrucose.

ON AMMIACEAE:
Cicuta bulbifera L., Nebraska, Wisconsin.
Cicuta maculata L., Florida, Colorado, Illinois, Indiana, Iowa, Nebraska.
Oenanthe californica S. Wats., California.
Sium cicutaefolium Schrank, New York, North Dakota, Wisconsin.
ON PRIMULACEAE:
Glaux maritima L., Montana, Wyoming.

II. Uredinia amphigenous, small, oblong, 0.1–0.2 mm. wide by 0.3–1 mm. long, tardily naked, dark cinnamon-brown, ruptured epidermis conspicuous; urediniospores ellipsoid or ovoid, 18–21 by 26–31 μ; wall golden-brown, moderately thin, 1–1.5 μ, sparsely and lowly echinulate, the pores 3 or 4, usually 4, equatorial.

III. Telia amphigenous, small, oblong, 0.1–0.2 mm. wide by 0.3–1 mm. long or longer when coalescing at ends, tardily naked (on some hosts indehiscent), somewhat pulverulent, blackish-brown, ruptured epidermis conspicuous; teliospores clavate-ellipsoid, 17–22 by 31–53 μ, obtuse or acute at both ends; wall light chestnut-brown, darker above, rather thin, 1–1.5 μ, thicker above, 3–7 μ; pedicel tinted, sometimes 60 μ long.

The species is composed of more or less sharply defined races (*cf.* Kleb. Wirtsw. Rostp. 325–329. 1904), only one of which has been cultivated in America (*cf.* Jour. Myc. **13**: 199. 1907).

ON CYPERACEAE:
Scirpus americanus Pers. (*S. pungens* Vahl), Alabama, Delaware.
Scirpus campestris Britton, North Dakota, South Dakota.
Scirpus fluviatilis (Torr.) A. Gray (*S. maritimus fluviatilis* Torr.), Illinois, Iowa, Kansas, Nebraska, Ohio, South Dakota, Wisconsin.
Scirpus pacificus Britton, California.
Scirpus paludosus A. Nels., Nova Scotia.
Scirpus robustus Pursh, Louisiana.
Scirpus validus Vahl (*S. lacustris* Bart. not L.), Nebraska, Wisconsin; Nova Scotia, Ontario.
TYPE LOCALITY: Marseille, France, on *Scirpus maritimus*.
DISTRIBUTION: East of the Rocky mountains from Montana to Nova Scotia southward to Louisiana and Florida, and in central California; also in Europe.
EXSICCATI: Ellis & Ev. N. Am. Fungi *1861*; Ellis & Ev. Fungi Columb. *1598*, *2189*; Barth. Fungi Columb. *2995*, *2996*, *3196*; Barth. N. Am. Ured. *196*; D. Griff. W. Am. Fungi *74*, *346*; Kellerm. Ohio Fungi *119*; Carleton, Ured. Am. *49*; Rab.-Wint.-Paz. Fungi Eur. *3931*; Brenckle, Fungi Dak. *120*, *120a*; Sydow, Ured. *2303*.

26. **Nigredo minuta** (Dietel) Arth. Résult. Sci. Congr. Bot. Vienne 344. 1906.

Uromyces minutus Dietel; Atk. Bull. Cornell Univ. **3**: 21. 1897.

O and I. Pycnia and aecia unknown.

II. Uredinia hypophyllous, scattered, small, oval or oblong, 0.2–0.4 mm. long, rather early naked, cinnamon-brown, ruptured epidermis conspicuous; urediniospores broadly ellipsoid, 10–15 by 15–19 μ; wall golden-brown, rather thin, about 1.5 μ, finely and rather sparsely echinulate, the pores 2, occasionally 3, approximately equatorial.

III. Telia hypophyllous, scattered, small, orbicular or oval, 0.1–0.4 mm. across, early naked, pulvinate, blackish-brown, ruptured epidermis conspicuous; teliospores obovoid or oval, 10–17 by 20–25 μ, rounded or obtuse above, narrowed or rounded below; wall chestnut-brown or lighter, concolorous, 1.5–2 μ thick, thicker at apex, 5–9 μ, smooth; pedicel colored, short, about length of spore or less.

ON CYPERACEAE:
Carex gracillima Schw., Wisconsin.
Carex lanuginosa Michx., Indiana.
Carex pubescens Muhl., Iowa.
Carex triceps Michx., Florida, Mississippi, Texas.
Carex virescens Muhl., Indiana.
Carex sp., Alabama.
TYPE LOCALITY: Auburn, Alabama, on *Carex* sp.
DISTRIBUTION: Florida to Texas, northward to Indiana and Iowa.
EXSICCATI: Sydow, Ured. *1003*.

27. **Nigredo valens** (Kern) Arthur.

Uromyces valens Kern, Rhodora **12**: 125. 1910.

O and I. Pycnia and aecia unknown.

II. Uredinia chiefly hypophyllous, scattered, oval or oblong, 0.3–0.4 mm. wide by 0.5–1 mm. long, tardily naked, somewhat pulverulent, cinnamon-brown, ruptured epidermis conspicuous; urediniospores ellipsoid, 16–19 by 19–26 μ; wall cinnamon-brown, 1.5–2 μ thick, evenly and strongly echinulate, the pores 4, equatorial.

III. Telia chiefly hypophyllous, scattered, oblong or linear, 0.2–0.4 mm. wide by 0.5–2 mm. or more long, rather tardily naked, pulvinate, chocolate-brown, ruptured epidermis conspicuous; teliospores oblong-obovoid or obovoid, 16–23 by 26–39 μ, rounded or often

acutish above, usually narrowed below; wall chestnut-brown, 1.5–2 μ thick, thicker above, 7–9 μ, smooth; pedicel hyaline, one to three times length of spore.

ON CYPERACEAE:
Carex lupulina Muhl., Indiana,
Carex utriculata Boott, Indiana.
TYPE LOCALITY: Mattsville, Hamilton County, Indiana, on *Carex utriculata*.
DISTRIBUTION: Known only from the state of Indiana.
ILLUSTRATION: Rhodora **12**: 126, *f. 2*.

28. **Nigredo perigynia** (Halsted) Arth. Résult. Sci. Congr. Bot. Vienne 344. 1906.

Uromyces perigynius Halsted, Jour. Myc. **5**: 11. 1889.
Uromyces caricinus Ellis & Ev. Bull. Torrey Club **22**: 58. 1895.
Caeomurus caricinus Kuntze, Rev. Gen. **3**^{3}: 449. 1898.
Caeomurus perigynius Kuntze, Rev. Gen. **3**^{3}: 450. 1898.
Uromyces Solidagini-Caricis Arth. Jour. Myc. **10**: 16. 1904.
Caeomurus Solidagini-Caricis Arth. Proc. Ind. Acad. Sci. **1903**: 144. 1904.
Nigredo caricina Arth. Résult. Sci. Congr. Bot. Vienne 343. 1906.
Nigredo Solidagini-Caricis Arth. Résult. Sci. Congr. Bot. Vienne 344. 1906.

O. Pycnia amphigenous, numerous, in extended groups, on conspicuous discolored spots, honey-yellow, not conspicuous, globoid, small, 60–80 μ in diameter; ostiolar filaments about 75 μ long.

I. Aecia chiefly hypophyllous, gregarious, in irregular or sometimes annular groups 2–4 mm. or more across, on larger discolored spots, cupulate, 0.1–0.2 mm. in diameter; peridium colorless, the margin lacerate, strongly recurved; peridial cells rhomboidal in longitudinal section, 16–20 μ thick by 22–29 μ long, the outer wall rather thick, 5–7 μ, finely and transversely striate, smooth, the inner wall thinner, 3–4 μ, moderately verrucose, somewhat striate; aeciospores globoid, 12–16 by 13–18 μ; wall colorless, thin, 1 μ, minutely verrucose.

ON CARDUACEAE:
Aster sp., proven by culture, but not yet collected.
Solidago rugosa Mill., Maine.
Solidago sp., Indiana.

II. Uredinia hypophyllous, scattered, oval or oblong, 0.3–0.7 mm. long, rather tardily naked, cinnamon-brown, slightly pulverulent, ruptured epidermis noticeable; urediniospores broadly ellipsoid, 14–19 by 18–26 μ; wall light cinnamon-brown, rather thin, 1–1.5 μ, moderately and rather sparsely echinulate, the pores 2, opposite and slightly superequatorial.

III. Telia chiefly hypophyllous, scattered, oblong or linear, 0.1–0.3 mm. wide by 0.3–0.8 mm. or more long, rather early naked, pulvinate, chocolate-brown, often appearing blackish, ruptured epidermis noticeable; teliospores obovoid or ellipsoid, 12–19 by 19–34 μ, rounded or sometimes narrowed above, usually narrowed below; wall light chestnut-brown, rather thin, 1.5 μ, much thicker at apex, 7–13 μ, smooth; pedicel slender, slightly tinted, as long as the spore, or longer.

ON CYPERACEAE:
Carex cristatella Britton (*C. cristata* Schw. not Clairv.), Ontario.
Carex deflexa Hornem., Indiana, Maine, Massachusetts, Vermont; Nova Scotia.
Carex flava L., Newfoundland, Nova Scotia.
Carex intumescens Rudge, Iowa, Wisconsin; Nova Scotia.
Carex Novae-Angliae Schw., Nova Scotia.
Carex scoparia Schkuhr, Delaware, New York; Nova Scotia.
Carex tribuloides Wahl., Ontario.
Carex sp., Colorado.
TYPE LOCALITY: Ames, Iowa, on *Carex intumescens*.
DISTRIBUTION: Delaware, Indiana, and Colorado northward, mostly local.
EXSICCATI: Ellis & Ev. N. Am. Fungi *2228*; Barth. Fungi Columb. *3590*; Shear, N. Y. Fungi *318*.

29. **Nigredo uniporula** (Kern) Arthur.

Uromyces uniporulus Kern, Rhodora **12**: 125. 1910.

O and I. Pycnia and aecia unknown.

II. Uredinia hypophyllous, scattered, roundish or oval, small, punctiform, 0.1–0.3 mm. across, rather early naked, somewhat pulvinate, light chestnut-brown, ruptured epidermis not conspicuous; urediniospores globose or subglobose, 18–21 by 21–23 μ; wall dark cinnamon-brown, rather thin, about 1.5 μ, rather sparsely and strongly echinulate, the pore 1, evident, in the lower part near the hilum.

III. Telia hypophyllous, scattered, oval or oblong, 0.2–0.5 mm. long, rather early naked, pulvinate, dark chestnut-brown, ruptured epidermis noticeable; teliospores obovoid, 13–16 by 19–27 μ, usually rounded above and narrowed below; wall cinnamon-brown, usually with a slightly paler umbo, thin, about 1 μ, thicker at apex, 4–7 μ, smooth; pedicel slightly tinted, about length of spore or less.

ON CYPERACEAE:
Carex gracillima Schw., Wisconsin.
Carex lenuis Rudge (*C. debilis Rudgei* Bailey), Connecticut.
TYPE LOCALITY: Central Village, Connecticut, on *Carex debilis Rudgei.*
DISTRIBUTION: Known only from two localities, but probably local from New England to Wisconsin.
ILLUSTRATION: Rhodora **12**: 125, *f. 1.*

30. **Nigredo Caladii** (Schw.) Arth. Résult. Sci. Congr. Bot. Vienne 343. 1906.

Aecidium Caladii Schw. Schr. Nat. Ges. Leipzig 1: 69. 1822.
Uredo Caladii Schw. Schr. Nat. Ges. Leipzig 1: 71. 1822.
Caeoma Caladii Link, in Willd. Sp. Pl. 6^2: 9. 1825.
Caeoma aroidatum Link, in Willd. Sp. Pl. 6^2: 43. 1825.
Caeoma (*Uredo*) *Ari-virginici* Schw. Trans. Am. Phil. Soc. II. **4**: 291. 1832.
Caeoma (*Aecidium*) *dracontionatum* Schw. Trans. Am. Phil. Soc. II. **4**: 292. 1832.
Puccinia Ari-triphylli Schw. Trans. Am. Phil. Soc. II. **4**: 297. 1832.
Aecidium (*Caeoma*) *aroidatum* Schw. Trans. Am. Phil. Soc. II. **4**: 309. 1832.
Aecidium (*Caeoma*) *dracontionatum* Schw. Trans. Am. Phil. Soc. II. **4**: 309. 1832.
Uromyces Peltandrae Howe, Bull. Torrey Club **5**: 3. 1874.
Uromyces Ari-virginici Howe, Bull. Torrey Club **5**: 43. 1874.
Uromyces Arisaemae Cooke, Bull. Torrey Club 6: 32. 1875.
Uromyces Caladii Farl.; Ellis, N. Am. Fungi *232*. 1879.
Aecidium importatum P. Henn. Verh. Bot. Ver. Brand. **37**: xxv. 1896.
Caeomurus Caladii Kuntze, Rev. Gen. 3^3: 449. 1898.

O. Pycnia from a perennial mycelium, chiefly hypophyllous, sometimes occurring also on the floral parts, evenly and extensively scattered over large areas, preceding or accompanying the aecia, abundant, punctiform, noticeable, half immersed, honey-yellow becoming brownish, globose, 100–160 μ in diameter, 96–128 μ high; ostiolar filaments rather short, 35–50 μ.

I. Aecia from a perennial mycelium, chiefly hypophyllous, rather evenly and extensively scattered, short, becoming cupulate, about 0.2–0.4 mm. in diameter; peridium colorless, the margin erect or somewhat spreading and recurved, finely eroded or sparingly lacerate; peridial cells oblong or slightly rhomboidal, about 23–32 μ long, 15–19 μ thick, the inner wall moderately verrucose, 3–4 μ, the outer wall inconspicuously striate, 6–8 μ; aeciospores subglobose or ellipsoid, 15–20 by 17–24 μ; wall pale-yellow, moderately thin, about 1.5 μ, evenly and finely verrucose.

II. Uredinia amphigenous, scattered, roundish, 0.5–0.8 mm. across, rather tardily naked, light cinnamon-brown, ruptured epidermis conspicuous; urediniospores ellipsoid, obovoid, or sometimes almost cuneiform, 15–24 by 24–35 μ, rounded above, often narrowed below; wall pale cinnamon-brown, 1.5–2 μ thick, somewhat thicker above, 3–5 μ, strongly and rather sparingly echinulate, the pores 4, equatorial.

III. Telia amphigenous, scattered, roundish or often irregular, rather tardily naked, light chestnut-brown, ruptured epidermis conspicuous; teliospores ellipsoid or obovoid, 17–24 by 23–35 μ, rounded or obtuse above and below; wall cinnamon-brown, 1.5–2 μ thick, with a small hyaline papilla at apex, 3–5 μ, smooth; pedicel hyaline, short, deciduous.

ON ARACEAE:
Arisaema macrospathum Benth., Morelos.
Arisaema triphyllum (L.) Schott (*Arum triphyllum* L.), Connecticut, Delaware, District of Columbia, Florida, Illinois, Indiana, Iowa, Kansas, Kentucky, Maine, Massachusetts, Minnesota, Mississippi, Missouri, Nebraska, New Hampshire, New Jersey, New York, North Carolina, Ohio, Pennsylvania, Rhode Island, South Carolina, South Dakota, Vermont, West Virginia, Wisconsin; Nova Scotia, Ontario.
Muricauda Dracontium (L.) Small (*Arisaema Dracontium* Schott), Alabama, Arkansas, Florida, Illinois, Indiana, Iowa, Kansas, Kentucky, Michigan, Mississippi, Missouri, Nebraska, New York, North Carolina, Ohio, Pennsylvania, Texas, West Virginia; Ontario.
Peltandra glauca (Ell.) Feay (*P. sagittaefolia* Morong not Raf., *Caladium sagittifolium* Nutt. not Vent., *Xanthosoma sagittifolium* Chapm. not Schott), Georgia, North Carolina.

Peltandra virginica (L.) Kunth (*Arum virginicum* L., *Peltandra undulata* Raf.), Delaware, District of Columbia, Florida, Indiana, Maryland, Massachusetts, New Jersey, New York, North Carolina, Virginia.

TYPE LOCALITY: North Carolina, on *Caladium sagittaefolium*.

DISTRIBUTION: From Nova Scotia westward to South Dakota, southward to Florida and Texas, and in central Mexico.

EXSICCATI: Rav. Fungi Am. *728*; Rav. Fungi Car. 4: *95, 96*; Ellis, N. Am. Fungi *232a, b, 233a, b*; Ellis & Ev. N. Am. Fungi *2406*; Ellis & Ev. Fungi Columb. *58, 659, 749, 1790*; Shear, N. Y. Fungi *129*; Rab.-Wint. Fungi Eur. *3624a, b, 3625*; Sydow, Ured. *752, 1301*; Kellerm. Ohio Fungi *59, 60*; Barth. Fungi Columb. *2291, 2392*.

31. **Nigredo pyriformis** (Cooke) Arthur.

Uromyces pyriformis Cooke; Peck, Ann. Rep. N. Y. State Mus. 29: 69. 1878.

O and I. Pycnia and aecia unknown.

II. Uredinia amphigenous, solitary or sometimes more or less confluent in irregular or oval groups, oval or oblong, 0.2–0.4 mm. wide by 0.5–1 mm. or more long, early naked, pulverulent, cinnamon-brown, ruptured epidermis conspicuous; urediniospores obovoid or ellipsoid, 18–19 by 21–26 μ; wall light cinnamon-brown, 1.5–2 μ thick, evenly and rather moderately echinulate, the pores usually 2, sometimes 3, approximately equatorial.

III. Telia amphigenous, usually in oval groups 0.7–1.5 by 1.5–5 mm., often confluent, sometimes solitary, oval or oblong, 0.2–0.3 mm. wide by 0.4–1.5 mm. long, early naked, pulvinate, blackish-brown, ruptured epidermis conspicuous; teliospores obovoid, 13–18 by 20–27 μ; wall light chestnut-brown, concolorous, 1.5–2 μ thick, much thicker above, 5–7 μ, smooth; pedicel tinted, about length of spore or shorter.

ON ARACEAE:

Acorus Calamus L., Illinois, Iowa, Maine, Michigan, New York, Virginia, Wisconsin; Ontario.

TYPE LOCALITY: New York, on *Acorus Calamus*.

DISTRIBUTION: Maine to Virginia, and westward to Iowa and Illinois.

EXSICCATI: Ellis, N. Am. Fungi *1071*; Rab.-Wint. Fungi Eur. *2903*; Sydow, Ured. *553*; Barth. Fungi Columb. *3098*.

32. **Nigredo Commelinae** (Speg.) Arthur.

Uredo Commelinae Speg. Anal. Soc. Ci. Argent. 9: 172. 1880.
Uromyces Commelinae Cooke, Trans. Roy. Soc. Edinb. 31: 342. 1888.
Uredo Spegazzinii De-Toni, in Sacc. Syll. Fung. 7: 845. 1888.
Uredo ochreacea Dietel, Hedwigia 36: 35. 1897.
Uredo commelinacea Ellis & Kelsey, Bull. Torrey Club 24: 209. 1897.
Uromyces tosensis P. Henn. Hedwigia 42: 107. 1903.
Uromyces Spegazzinii Arth. Bull. Torrey Club 37: 573. 1910.

O and I. Pycnia and aecia unknown.

II. Uredinia amphigenous and caulicolous, scattered, or somewhat gregarious, sometimes circinate, roundish or oval, 0.5–0.8 mm. across, soon naked, cinnamon-brown, pulverulent, ruptured epidermis conspicuous; urediniospores broadly ellipsoid, 20–26 by 26–35 μ; wall rather thick, 2–2.5 μ, dark cinnamon-brown or chestnut-brown, finely echinulate, the pores 2, equatorial.

III. Telia amphigenous, scattered, roundish or oval, 0.6–1 mm. across, soon naked, pulvinate, chocolate-brown, ruptured epidermis conspicuous; teliospores ellipsoid or obovoid, 21–24 by 29–35 μ, usually rounded above and below; wall variable in color, mostly chestnut-brown, 1.5-2 μ thick, thicker above, 8–10 μ, with a slightly paler umbo; pedicel nearly or quite colorless, rather thick, about length of spore, sometimes longer.

ON COMMELINACEAE:

Commelina angustifolia Michx., Florida.
Commelina elegans H.B.K., St. Croix.
Commelina erecta L., Florida.
Commelina virginica L., Florida, Texas.
Commelina sp., St. Thomas.

TYPE LOCALITY: Recoleta, Argentina, on "*Commelina sulcata*," said to be error for *Tradescantia guyanensis*.

DISTRIBUTION: Florida and Texas southward; also in South America, Africa, and Japan, and doubtless throughout the warmer parts of the world, usually in the uredinial stage.

EXSICCATI: Barth. Fungi Columb. *2492*.

33. **Nigredo Pontederiae** (W. Gerard) Arthur.

Uromyces Pontederiae W. Gerard, Bull. Torrey Club 6: 31. 1875.
Uredo Pontederiae Speg. Anal. Soc. Ci. Argent. 9: 172. 1880.
Uromyces Pontederiae Speg. Anal. Soc. Ci. Argent. 26: 12. 1888.

O and I. Pycnia and aecia unknown.

II. Uredinia amphigenous, scattered, on small purplish spots, small, roundish or oval, 0.3–0.5 mm. across, rather tardily naked, light cinnamon-brown, somewhat pulverulent, ruptured epidermis noticeable; urediniospores ellipsoid, 18–21 by 23–29 μ; wall golden-brown, rather thin, 1–1.5 μ, moderately and sharply echinulate, the pores 4, equatorial, rather obscure.

III. Telia amphigenous, scattered or sometimes in small groups, often on small purplish spots, roundish or oval, 0.2–0.4 mm. across, tardily naked, pulvinate, chocolate-brown, ruptured epidermis conspicuous; teliospores obovoid or broadly clavate, 13–18 by 21–29 μ, rounded or obtuse above, usually narrowed below; wall golden-brown, rather thin, 1–1.5 μ, much thicker above, 5–9 μ, smooth; pedicel tinted, short, length of spore or less.

ON PONTEDERIACEAE:
Pontederia cordata L., Delaware, Florida, Georgia, Missouri, New York.
TYPE LOCALITY: Poughkeepsie, New York, on *Pontederia cordata*.
DISTRIBUTION: Along the Atlantic coast from southeastern New York southward, and in Missouri; also in South America.
EXSICCATI: Rav. Fungi Am. *793*.

34. **Nigredo Junci** (Desmaz.) Arthur.

Puccinia Junci Desmaz. Pl. Crypt. *81*. 1825.
Aecidium zonale Duby, Bot. Gall. **2**: 906. 1830.
Uromyces Junci L. Tul. Ann. Sci. Nat. IV. **2**: 146. 1854.
Puccinella truncata Fuckel, Enum. Fung. 18. 1861.
Puccinella Junci Fuckel, Symb. Myc. 60. 1869.
Caeomurus Junci Kuntze, Rev. Gen. 3^3: 450. 1898.
Aecidium Cardui Arth. Bull. Torrey Club **33**: 33. 1906. Not *A. Cardui* Sydow, 1901.

O. Pycnia epiphyllous, in small groups, inconspicuous, immersed, orange-yellow, globose, 130–180 μ in diameter.

I. Aecia hypophyllous, crowded in circinating groups 3–5 mm. across, on discolored spots, rather short, cupulate, 0.2–0.3 mm. in diameter; peridium colorless, the margin erect or spreading, erose; peridial cells rhombic, 26–35 μ long, overlapping, the walls transversely striate, the outer wall about 7–9 μ thick, the inner wall somewhat thinner, 3–5 μ; aeciospores globoid, small, 15–18 by 16–20 μ; wall nearly colorless, very thin, 1–1.5 μ, very minutely verruculose.

ON AMBROSIACEAE:
Ambrosia psilostachya DC., Colorado, Nebraska, North Dakota.
ON CARDUACEAE:
Arnica celsa A. Nels., Colorado.
Arnica cordifolia Hook., South Dakota.
Cirsium Flodmanii (Rydb.) Arth. (*Carduus Flodmanii* Rydb.), North Dakota.
Cirsium Hookerianum Nutt. (*Carduus Hookerianus* Heller), Montana.

II. Uredinia amphigenous, numerous, scattered, roundish or elongate, 0.3–0.5 mm. broad by 0.3–1.5 mm. long, at first covered by the epidermis, finally naked, dark cinnamon-brown, ruptured epidermis very conspicuous; urediniospores broadly ellipsoid or occasionally slightly obovoid, 16–21 by 18–28 μ; wall pale cinnamon-brown, about 1.5–2 μ thick, sparsely and rather prominently verrucose with widely separated blunt papillae, the pores 2, rarely 3, equatorial.

III. Telia amphigenous, numerous, scattered, roundish, irregular, or often elongate, 0.2–0.8 mm. wide by 0.5–2 mm. or more long, often confluent, soon naked, firm, blackish-brown, ruptured epidermis conspicuous; teliospores angularly obovoid, rounded or acuminate above, usually narrowed below, 15–21 by 26–40 μ; wall chestnut-brown, 1.5–2 μ thick, much thicker at apex, 7–13 μ, smooth; pedicel tinted, once to twice length of spore.

The species appears to have well marked races with aecia on different genera of the Carduaceae and Ambrosiaceae. In America only aecia on *Cirsium* have been proved by cultures to belong to it, while in Europe the best known form goes to *Pulicaria*.

ON JUNCACEAE:
Juncus balticus Willd., California, Colorado, Idaho, Kansas, Montana, Nebraska, North Dakota, South Dakota, Washington, Wyoming.
Juncus Lescurii Boland., California.
Juncus mexicanus Willd. (*J. compressus* Willd.), California; Mexico (state).
Juncus textilis Buchenau, California.
TYPE LOCALITY: France, on *Juncus sylvaticus*.
DISTRIBUTION: North Dakota to Kansas and westward to the Pacific coast, southward to central Mexico.
ILLUSTRATION: Beitr. Krypt. Schweiz 2^2: *f. 43*.
EXSICCATI: Clements, Crypt. Form. Colo. *537;* D. Griff. W. Am. Fungi *36, 374;* Brenckle, Fungi Dak. *20, 26, 51;* Sydow, Ured. *1701, 2253;* Carleton, Ured. Am. *23;* Barth. Fungi Columb. *3296, 3593*.

35. **Nigredo Silphii** (Burrill) Arthur.

Aecidium compositarum Silphii Burrill; De-Toni, in Sacc. Syll. Fung. **7**: 798. 1888.
Aecidium Silphii Sydow, Ured. *1546*. 1901.
Uromyces Silphii Arth. Jour. Myc. **13**: 202 1907.
Uromyces Junci-tenuis Sydow, Monog. Ured. **2**: 289. 1910.

O. Pycnia chiefly epiphyllous, in small groups, golden-brown, subglobose, 80–100 μ broad by 80–110 μ high; ostiolar filaments hyaline, free, up to 65 μ long.

I. Aecia amphigenous, in groups 4–10 mm. across, crowded about the pycnia on discolored spots, deep-seated, short, 0.2–0.4 mm. in diameter; peridium colorless, the margin recurved, lacerate; peridial cells rhombic, 20–28 μ across, the outer wall thick, 6–8 μ, transversely striate, the inner wall thinner, 4–6 μ, moderately verrucose; aeciospores angularly globoid, small, 13–18 μ in diameter; wall colorless, thin, about 1 μ, minutely verrucose.

ON CARDUACEAE:
Silphium integrifolium Michx., Illinois, Missouri, Wisconsin.
Silphium laciniatum L., Illinois, Iowa, Kansas.
Silphium perfoliatum L., Indiana, Iowa, Wisconsin.
Silphium terebinthinaceum Jacq., Illinois, Missouri, Ohio, Wisconsin.

II. Uredinia amphigenous, scattered, roundish or somewhat elongate, small, 0.2–0.3 mm. wide by 0.3–0.5 mm. long, tardily naked, dark cinnamon-brown, ruptured epidermis not conspicuous; urediniospores broadly ellipsoid or sometimes obovoid, 13–19 by 15–23 μ; wall golden-yellow, about 1.5 μ thick, sparsely and bluntly echinulate, the pores 2, superequatorial.

III. Telia amphigenous, scattered, roundish or somewhat elongate, small, 0.2–0.3 mm. wide by 0.2–0.6 mm. long, finally naked, firm, somewhat pulvinate, blackish-brown, ruptured epidermis noticeable; teliospores angularly obovoid, rounded, truncate or occasionally pointed above, usually narrowed below, 12–19 by 26–35 μ; wall chestnut-brown, 1.5–2 μ thick, much thicker above, 7–10 μ, smooth; pedicel light chestnut-brown, one to one and a half times length of spore.

ON JUNCACEAE:
Juncus dichotomus Ell., Delaware, Florida, Georgia, New Jersey.
Juncus Dudleyi Wiegand, Colorado, Indiana, Nebraska, Washington.
Juncus Greenei Oakes & Tuck., Connecticut.
Juncus interior Wiegand, Colorado, Illinois, Iowa, Nebraska, New Mexico, South Dakota, Texas.
Juncus longistylis Torrey, Colorado, Idaho, Montana, Nebraska, Washington, Wyoming; Manitoba.
Juncus marginatus Rostk., Nebraska.
Juncus setosus (Cov.) Small, Nebraska.
Juncus tenuis Willd., Delaware, Indiana, Iowa, Kansas, Kentucky, Louisiana, Maine, Massachusetts, Michigan, Minnesota, Missouri, Nebraska, New York, North Carolina, North Dakota, South Dakota, Texas, Virginia, Washington, West Virginia, Wisconsin; Ontario.
TYPE LOCALITY: McLean county, Illinois, on *Silphium integrifolium*.
DISTRIBUTION: Sierra Nevada and Cascade Mountains eastward through the United States and Canada to the Atlantic coast.
EXSICCATI: Brenckle, Fungi Dak. *21;* Seym. & Earle, Econ. Fungi *52, 528;* Sydow, Ured. *1546, 2106;* Ellis & Ev. Fungi Columb. *1478;* Barth. Fungi Columb. *9394, 2595, 2796, 2800, 3094, 3095;* Rab.-Wint.-Paz. Fungi Eur. *3835b;* D. Griff. W. Am. Fungi *244;* Vesterg. Micr. Rar. Sel. *626*.

36. **Nigredo Junci-effusi** (Sydow) Arthur.

Puccinia Junci Schw. Trans. Am. Phil. Soc. II. 4: 295. 1832. Not *P. Junci* Desmaz. 1825.
Uromyces effusus Arth. Jour. Myc. **13**: 193. 1907. Not *U. effusus* De-Toni, 1888.
Uromyces Junci-effusi Sydow, Monog. Ured. **2**: 290. 1910.

O and I. Pycnia and aecia unknown.

II. Uredinia amphigenous, scattered, oblong or linear, 0.1–0.3 mm. wide by 0.3–1.5 mm. long, tardily naked, dark cinnamon-brown, ruptured epidermis very conspicuous; urediniospores broadly ellipsoid, 14–19 by 18–26 μ (western forms 16–24 by 21–29 μ); wall yellow to light cinnamon-brown, about 1.5 μ thick (western forms about 2 μ), moderately verrucose-echinulate, the pores 3 or 4, equatorial.

III. Telia amphigenous, numerous, scattered, oblong or linear, 0.2–0.5 mm. wide by 0.3–2 mm. or more long, rarely confluent, finally naked, ruptured epidermis very conspicuous; teliospores obovoid or broadly ellipsoid, 13–23 by 24–40 μ, obtuse or rarely acute at apex, usually narrowed below; wall chestnut-brown, 1.5–2 μ thick, much thicker above, 6–10 μ, smooth; pedicel tinted, about as long as the spore.

ON JUNCACEAE:

Juncus effusus L., Delaware, Maryland, Massachusetts, Missouri, New Jersey, New York, North Carolina, Ohio, Pennsylvania, South Carolina, Tennessee, West Virginia.
Juncus ensifolius Wikstr., California, Montana, Oregon, Washington.
Juncus filiformis L., Nova Scotia.
Juncus nevadensis S. Wats., California.
Juncus orthophyllus Cov., Oregon, Washington.
Juncus oxymeris Engelm., California, Oregon.
Juncus phaeocephalus Engelm., California.
Juncus saximontanus A. Nels., Utah.
Juncus Suksdorfii Piper, Washington.
Juncus xiphioides E. Meyer, California; British Columbia.

TYPE LOCALITY: Bethlehem, Pennsylvania, on *Juncus effusus*.

DISTRIBUTION: Nova Scotia to South Carolina, and westward to British Columbia and California; rare in the interior of the continent.

EXSICCATI: Ellis & Ev. Fungi Columb. *339*; Barth. Fungi Columb. *2991*; Ellis, N. Am. Fungi *238*; Shear, N. Y. Fungi *76*; Kellerm. Ohio Fungi *38*; Rav. Fungi Am. *51*; Garrett, Fungi Utah. *149*, *198*; Sydow, Ured. *1760*, *1904*; D. Griff. W. Am. Fungi *373*.

37. **Nigredo Zygadeni** (Peck) Arth. Résult. Sci. Congr. Bot. Vienne 344. 1906.

Uromyces Zygadeni Peck, Bot. Gaz. 6: 239. 1881.
Caeomurus Zygadeni Kuntze, Rev. Gen. 3^3: 451. 1898.
Uromyces Fraserae Arth. & Ricker, Jour. Myc. 8: 128. 1902.

O. Pycnia amphigenous, gregarious, punctiform, honey-yellow, inconspicuous, immersed, small, globoid, 85–115 μ wide; ostiolar filaments 40–50 μ long.

I. Aecia amphigenous, indefinitely grouped, often crowded, cupulate, short, 0.2–0.3 mm. in diameter; peridium delicate, the margin erect, lacerate; peridial cells rhomboidal, 19–26 μ long, somewhat overlapping, the outer wall transversely striate, rather thick, 4–6 μ, the inner wall finely verrucose, somewhat thinner; aeciospores globoid, 16–23 by 19–28 μ; wall pale-yellow, rather thin, 1–1.5 μ, finely and closely verrucose.

II. Uredinia amphigenous, scattered, roundish or elliptical, about 0.5 mm. across, soon naked, cinnamon-brown, pulverulent, ruptured epidermis conspicuous; urediniospores broadly ellipsoid or obovate-globoid, 19–25 by 21–31 μ; wall yellow, rather thin, 1.5–2 μ, finely and closely verrucose-echinulate, the pores 6–8, scattered.

III. Telia amphigenous, scattered, roundish, 0.3–0.5 mm. across, tardily naked, bullate, blackish-brown; teliospores obovoid, angular and somewhat irregular, 19–26 by 25–33 μ, the apex rounded or truncate, the base narrowed; wall chestnut-brown, 2.5–3 μ thick, not or only slightly thickened above; pedicels lightly tinted, slender, about length of spore.

ON MELANTHACEAE:

Anticlea elegans (Pursh) Rydb. (*Zygadenus elegans* Pursh), Colorado, Wyoming.
Toxicoscordion falcatum Rydb. (*Zygadenus falcatus* Rydb.), Colorado, Utah.
Toxicoscordion Fremonti (Torr.) Rydb. (*Zygadenus Fremonti* Torr.), California.
Toxicoscordion intermedium Rydb. (*Zygadenus intermedius* Rydb.), Montana, Wyoming.
Toxicoscordion Nuttallii (A. Gray) Rydb. (*Zygadenus Nuttallii* S. Wats.), Kansas.
Toxicoscordion paniculatum (Nutt.) Rydb. (*Zygadenus paniculatus* S. Wats.), Utah.

TYPE LOCALITY: Utah, on *Zygadenus paniculatus*.

DISTRIBUTION: Throughout the Rocky Mountains and extending to the plains in central Kansas and to near the coast in California.

EXSICCATI: Ellis & Ev. N. Am. Fungi *1872*, *1873*, *1874*; Sydow, Ured. *1765*.

38. **Nigredo aemula** Arthur.

Uromyces aemulus Arth. Bull. Torrey Club 38: 373. 1911.

O. Pycnia very few, punctiform.

I. Aecia amphigenous, rather closely but irregularly arranged in oval groups 0.5–1 cm. long, on pale unthickened spots, cylindrical, 0.2–0.3 mm. in diameter, 0.3–0.6 mm. high; peridium colorless, the margin erose or somewhat lacerate; peridial cells rhomboidal, 13–19 by 19–26 μ, the outer wall thick, 5–7 μ, transversely striate, the inner wall thinner, 3–4 μ, strongly verrucose; aeciospores globoid or irregularly ellipsoid, 20–24 by 23–26 μ, often angular; wall pale yellow, moderately thick, 1.5–2 μ, finely verrucose.

II. Uredinia amphigenous, widely scattered, rather prominent, oblong or oval, 0.2–0.4 mm. broad by 0.5–2 mm. long, blister-like, dehiscent by a longitudinal slit, yellowish or light cinnamon-brown, somewhat pulverulent, ruptured epidermis conspicuous; urediniospores globoid or broadly ellipsoid, 22–29 by 25–33 μ; wall golden-yellow, moderately thick, 1.5–2 μ, inconspicuously echinulate, the pores 5–8, scattered, indistinct.

III. Telia amphigenous, prominent, widely and rather evenly scattered, elliptical to elongate-oblong, 0.3–1 mm. broad by 0.8–3 mm. long, at first covered by the gray epidermis, eventually naked, somewhat pulverulent, dark chocolate-brown or blackish; stroma absent; teliospores globoid or obovate-globoid, 18–24 by 24–30 μ; wall chestnut-brown, concolorous, moderately thick, 2–2.5 μ, slightly or not thickened above, 2.5–4 μ, smooth; pedicel slender, slightly tinted, about once length of spore, usually persistent.

ON ALLIACEAE:
Allium acuminatum Hook., Utah.
Allium brevistylum S. Wats., Colorado, Wyoming.
Allium validum S. Wats., Nevada.
TYPE LOCALITY: Yancey's, Yellowstone National Park, Wyoming, on *Allium brevistylum*.
DISTRIBUTION: Central Rocky Mountain region, mostly at higher altitudes.
EXSICCATI: Garrett, Fungi Utah. *83* (in part); D. Griff. W. Am. Fungi *391*.

39. **Nigredo bicolor** (Ellis) Arth. Résult. Sci. Congr. Bot. Vienne 343. 1906.

Uromyces bicolor Ellis; Coville, Contr. U. S. Nat. Herb. **4**: 231. 1893.
Uromyces aterrimus Dietel & Holway; Dietel, Erythea **3**: 78. 1895.
Uromyces bicolor Ellis & Ev. Bull. Torrey Club **24**: 282. 1897.
Caeomurus bicolor Kuntze, Rev. Gen. 3^3: 449. 1898.

O. Pycnia amphigenous, scattered among the aecia, often at tips of the leaves, punctiform, honey-yellow, inconspicuous, depressed-globoid, 80–100 μ wide by 60–80 μ high.

I. Aecia amphigenous, loosely and irregularly arranged in oval groups 0.5–1 cm. long, often at tips of the leaves, on pale unthickened spots, urceolate, 0.2–0.4 mm. in diameter; peridium colorless, the margin irregularly lacerate, rather fragile; peridial cells rhomboidal, 16–19 by 23–29 μ, the outer wall thick, 5–7 μ, inconspicuously and transversely striate, the inner wall thinner, 3–4 μ, strongly verrucose; aeciospores broadly ellipsoid, 21–26 by 25–35 μ, often angular; wall yellow, moderately thick, 1.5–2 μ, finely verrucose.

II. Uredinia amphigenous, somewhat gregarious and inclined to be restricted to small areas surrounded by telia, usually large, prominent, oval, 0.2–0.6 mm. broad by 0.5–3.5 mm. long, blister-like, dehiscent by a longitudinal slit, yellowish or light cinnamon-brown, somewhat pulverulent, ruptured epidermis conspicuous; urediniospores broadly ellipsoid or obovoid, 24–29 by 28–34 μ; wall golden-yellow, moderately thick, 1.5–2 μ, inconspicuously echinulate, the pores 7–12, scattered, distinct.

III. Telia amphigenous, very small, punctiform, but more usually confluent into dendritic groups, or into compact compound sori 1–5 mm. long, permanently covered, chocolate-brown to grayish-black, each small sorus surrounded by a strongly developed, golden-brown stroma; teliospores broadly obovoid or pyriform, 19–26 by 26–37 μ, usually angular, obtuse or rounded above, obtuse or narrowed below; wall chestnut-brown, concolorous, moderately thick, 1.5–2 μ, only slightly thickened at apex, 3–5 μ, smooth; pedicel slender, slightly tinted, one half to once length of spore, usually deciduous.

ON ALLIACEAE:
Allium acuminatum Hook., Colorado.
Allium canadense L., Massachusetts, Missouri, Texas.

Allium validum S. Wats., California, Idaho.
Allium unifolium Kellogg, California.

TYPE LOCALITY: Near Mineral King, Sierra Nevada, Tulare County, California, on *Allium validum*.

DISTRIBUTION: Local, across the continent from Massachusetts to California.

EXSICCATI: Sydow, Ured. *1102*, *1351*; Ellis & Ev. N. Am. Fungi *3344*; Ellis & Ev. Fungi Columb. *861*; Barth. Fungi Columb. *2491*; Barth. N. Am. Ured. *185*; Vesterg. Micr. Rar. Sel. *988*.

40. **Nigredo Lilii** (G. W. Clinton) Arth. Résult. Sci. Congr. Bot. Vienne 344. 1906.

Uromyces Lilii G. W. Clinton; Peck, Ann. Rep. N. Y. State Mus. **27**: 103. 1875.
Uromyces Holwayi Lagerh. Hedwigia **28**: 108. 1889.
Caeomurus Holwayi Kuntze, Rev. Gen. **3**[3]: 450. 1898.
Caeomurus Lilii Kuntze, Rev. Gen. **3**[3]: 450. 1898.

O. Pycnia chiefly hypophyllous, widely separated in groups 2–3 mm. across, not conspicuous, honey-yellow becoming brownish, globoid, 100–125 μ in diameter; ostiolar filaments 50–60 μ long.

I. Aecia chiefly hypophyllous, gregarious, in groups 3–5 mm. across, short, cupulate, 0.4–0.7 mm. in diameter; peridium colorless, the margin erect, erose; peridial cells linear-rhomboidal, 32–42 μ long, the walls of about equal thickness, 2–3 μ, the inner wall moderately verrucose; aeciospores globoid, 14–19 by 16–22 μ; wall colorless, thin, 1 μ, finely verrucose.

II. Uredinia amphigenous, gregarious or occasionally solitary, roundish or oval, 0.3–0.6 mm. across, rather tardily naked, pulverulent, cinnamon-brown, ruptured epidermis conspicuous; urediniospores broadly ellipsoid or obovoid, 20–26 by 23–30 μ; wall light cinnamon-brown, rather thick, 2.5–3 μ, sparsely and rather finely verrucose-echinulate, the pores 2 or 3, approximately equatorial.

III. Telia amphigenous, widely separated in irregular groups 3–7 mm. across, rather tardily naked, pulvinate, chocolate-brown, ruptured epidermis conspicuous; teliospores broadly ellipsoid or obovate-ellipsoid, 18–25 by 29–39 μ; wall chestnut-brown, 2–2.5 μ thick, with a small tinted apiculus, 5–7 μ, moderately rugose with longitudinal parallel ridges, sometimes appearing almost smooth when wet; pedicel hyaline, very short.

ON LILIACEAE:
Lilium canadense L., Connecticut, Maine, Massachusetts, New Jersey, New York, Wisconsin.
Lilium candidum L., Connecticut.
Lilium columbianum Hanson, California, Washington; British Columbia.
Lilium pardalinum Kellogg, California.
Lilium parvum Kellogg, California.
Lilium philadelphicum L., Massachusetts, New Hampshire, New York.
Lilium rubescens S. Wats., California.
Lilium superbum L., Iowa, Michigan, Minnesota, Wisconsin; Ontario.
Lilium umbellatum Pursh, Nebraska.
Lilium Washingtonianum Kellogg, California.

TYPE LOCALITY: Buffalo, New York, on *Lilium canadense*.

DISTRIBUTION: From Maine and New York westward to Nebraska, and along the Pacific coast from British Columbia southward to central California.

EXSICCATI: Ellis, N. Am. Fungi *1072*; Ellis & Ev. N. Am. Fungi *1864b*, *3241*; Seym. & Earle, Econ. Fungi Suppl. *B4*; Sydow, Ured. *753*, *1759*; Barth. N. Am. Ured. *187*.

41. **Nigredo houstoniata** (Schw.) J. Sheldon, Torreya **9**: 55. 1909.

Caeoma (*Aecidium*) *houstoniatum* Schw. Trans. Am. Phil. Soc. II. **4**: 293. 1832.
Aecidium (*Caeoma*) *houstoniatum* Schw. Trans. Am. Phil. Soc. II. **4**: 309. 1832.
? *Aecidium cylindricum* Ellis & Ev. Bull. Torrey Club **22**: 61. 1895.
Uromyces Murrillii Ricker, Mycologia **1**: 237, hyponym. 1909.
Uromyces houstoniatus J. Sheldon, Torreya **9**: 55. 1909.

O. Pycnia hypophyllous, sometimes occupying the whole under surface of a leaf, numerous, not conspicuous, pale-yellow becoming reddish-brown, globoid or slightly depressed-globose, 80–100 μ in diameter, 65–80 μ high; ostiolar filaments 45–65 μ long.

I. Aecia hypophyllous, loosely scattered, often occupying the whole under surface of a leaf, short, cupulate, 0.2–0.4 mm. in diameter; peridium colorless, the margin rather finely erose; peridial cells rhomboidal, 19–26 μ long, the outer wall rather thick, 4–6 μ, transversely striate, the inner wall slightly thinner, 3–4 μ, moderately verrucose; aeciospores globoid, 13–18 by 16–19 μ; wall colorless, thin, 1 μ, finely verrucose.

ON RUBIACEAE:
? *Houstonia angustifolia* Michx., Kansas, Texas.
Houstonia caerulea L., Connecticut, Delaware, Massachusetts, Missouri, Pennsylvania, West Virginia.
? *Houstonia minima* Beck, Texas.
? *Houstonia purpurea* L., West Virginia.

II. Uredinia amphigenous, arranged in small groups, oblong or linear, 0.3–0.8 mm. long, early naked, somewhat pulverulent, very pale cinnamon-brown, ruptured epidermis noticeable; urediniospores broadly ellipsoid, 16–19 by 23–26 μ; wall golden-brown, 1.5–2 μ thick, sharply and strongly echinulate, the pores 3, rarely 4, equatorial.

III. Telia amphigenous, arranged in longitudinal lines, sometimes confluent, about 0.1–0.2 mm. wide by 0.3–0.8 mm. long, soon naked, cinnamon-brown, or paler from germination of the spores, pulvinate, ruptured epidermis noticeable; teliospores narrowly ellipsoid, obtuse or acute at both ends, 12–17 by 28–34; wall pale-yellow, smooth, thin, 1 μ, thicker above, 4–9 μ; pedicel hyaline, one to one and a half times length of spore.

ON IRIDACEAE:
Sisyrinchium angustifolium Mill., Maine.
Sisyrinchium gramineum Curtis (*S. graminoides* Bickn.), West Virginia.
TYPE LOCALITY: Bethlehem, Pennsylvania, on *Houstonia caerulea*.
DISTRIBUTION: Along the Atlantic coast from Maine to West Virginia, and in Missouri, possibly also from Kansas to Texas.
EXSICCATI: Ellis, N. Am. Fungi *1422;* Rab.-Wint.-Paz. Fungi Eur. *3936* (?); Barth. Fungi Columb. *2403*.

42. **Nigredo proba** Arthur.

Uromyces probus Arth. Bull. Torrey Club **38**: 376. 1911.

O. Pycnia not seen.

I. Aecia amphigenous, on the veins in series or rows 1–3 mm. long, short, cupulate, 0.3–0.4 mm. in diameter; peridium colorless, erect or spreading, the margin erose; peridial cells rhomboidal, 28–35 μ long, the outer wall rather thick, 4–6 μ, transversely striate, the inner wall about 3 μ thick, moderately verrucose; aeciospores broadly ellipsoid, 18–21 by 23–26 μ; wall colorless, thin, about 1.5 μ, finely verrucose.

II. Uredinia amphigenous, solitary or often in crowded groups 2–8 mm. across, sometimes confluent, oblong or linear, 0.5–5 mm. long, rather soon naked, somewhat pulverulent, light cinnamon-brown, ruptured epidermis conspicuous; urediniospores broadly ellipsoid, 19–23 by 26–31 μ; wall golden-yellow, moderately thick, 2–3 μ, sparsely echinulate with fine short points, the pores 5 or 6, scattered.

III. Telia usually amphigenous, thickly scattered, numerous, sometimes in series, oblong or linear, 0.5–4 mm. or more long, rather tardily naked, pulvinate, chocolate-brown, ruptured epidermis conspicuous; teliospores broadly ellipsoid or obovate-ellipsoid, 16–21 by 23–29 μ; wall dark cinnamon-brown, thin, about 1.5 μ, slightly thicker at apex, 2–3 μ, smooth; pedicels very slightly tinted, usually shorter than spore.

ON IRIDACEAE:
Olsynium grandiflorum (Dougl.) Raf. (*Sisyrinchium grandiflorum* Dougl.), Idaho, Washington.
TYPE LOCALITY: Columbia River, Washington, on leaves of *Olsynium grandiflorum*.
DISTRIBUTION: Northwestern part of the United States.
EXSICCATI: Ellis & Ev. Fungi Columb. *546;* Ellis & Ev. N. Am. Fungi *3137*.

43. **Nigredo Polygoni** (Pers.) Arth. Résult. Sci. Congr. Bot. Vienne 344. 1906.

Puccinia Polygoni Pers. Neues Mag. Bot. **1**: 119. 1794.
Puccinia Polygoni-Avicullariae Pers. Syn. Fung. 227. 1801.
Uredo Centumnodii Schum. Enum. Pl. Saell. **2**: 231. 1803.
Puccinia Avicullariae DC. Fl. Fr. **2**: 221. 1805.
Dicaeoma Avicullariae S. F. Gray, Nat. Arr. Brit. Pl. **1**: 542. 1821.
Capitularia Polygoni Rab. Bot. Zeit. **9**: 449. 1851.
Uromyces Polygoni Fuckel, Symb. Myc. 64. 1869.
Uromyces Avicullariae Schröt. Abh. Schles. Ges. **48**: 8. 1870.
Caeomurus Polygoni Kuntze, Rev. Gen. **3**^{3}: 450. 1898.

O. Pycnia amphigenous, few, in small groups about 0.5 mm. across, inconspicuous, honey-yellow becoming brownish, depressed-globoid, 112–144 μ in diameter, 75–100 μ high; ostiolar filaments 75–90 μ long.

I. Aecia amphigenous, gregarious, in annular or crowded groups 1–1.5 mm. across, on discolored spots, short, cupulate or occasionally somewhat elongate, 0.1–0.2 mm. in diameter; peridium colorless, the margin erose; peridial cells rhomboidal, 26–32 μ long, overlapping, the outer wall rather thick, 6–8 μ, transversely striate, the inner wall thinner, 2–3 μ, somewhat striate, very moderately verrucose; aeciospores globoid, 15–18 by 16–19 μ; wall light-yellow or colorless, thin, 1 μ, finely verrucose.

II. Uredinia amphigenous, scattered, roundish, 0.3–0.8 mm. across, early naked, somewhat pulverulent, cinnamon-brown, ruptured epidermis conspicuous; urediniospores broadly ellipsoid or obovoid, 15–22 by 19–27 μ; wall golden-brown, 1.5–2 μ thick, finely and closely verrucose, the pores 4, equatorial.

III. Telia amphigenous, scattered, oval or oblong, 0.5–1 mm. long, often confluent, early naked, pulvinate, chocolate-brown, ruptured epidermis noticeable; teliospores broadly ellipsoid or obovate-ellipsoid, 16–24 by 23–32 μ, slightly narrowed below, usually rounded above; wall cinnamon-brown, 2–3 μ thick, thicker at apex, 4–7 μ, smooth; pedicel hyaline, once to twice length of spore.

ON POLYGONACEAE:
Polygonum aviculare L., California, Connecticut, Delaware, Illinois, Indiana, Iowa, Kansas, Maine, Massachusetts, Michigan, Minnesota, Nebraska, New Jersey, New York, North Dakota, South Dakota, Utah, Vermont, Washington, Wisconsin; Ontario.
Polygonum buxiforme Small, California, Colorado.
Polygonum erectum L., Connecticut, Delaware, Illinois, Indiana, Iowa, Mississippi, Missouri, Nebraska, New Jersey, New York, North Carolina, Pennsylvania, South Dakota, West Virginia, Wisconsin.
Polygonum Fowleri B. L. Robinson, Maine; Newfoundland.
Polygonum maritimum L., Louisiana.
Polygonum ramosissimum Michx., Illinois, Iowa, Kansas, Minnesota, Missouri, Montana, Nebraska.
Polygonum sawatchense Small, Colorado.
Polygonum spergulariaeforme Meissn., British Columbia.
TYPE LOCALITY: Europe, on *Polygonum aviculare*.
DISTRIBUTION: Throughout the United States northward into Canada; also in Europe, Africa, Asia, and Australia.
ILLUSTRATIONS: Beitr. Krypt. Schweiz 2^2: *f. 46*; McAlpine, Rusts Austr. *pl. 18, f. 150, 151*.
EXSICCATI: Ellis, N. Am. Fungi *237*; Ellis & Ev. Fungi Columb. *252, 1897, 1898, 2188*; Seym. & Earle, Econ. Fungi *361, 362a, b, 363, 368, 369a, b, c*; Kellerm. & Swingle, Kans. Fungi *50*; D. Griff. W. Am. Fungi *55, 338*; Sydow, Ured. *1807*; Shear, N. Y. Fungi *77, 124*; Barth. Fungi Columb. *2994, 3097*; Clements, Crypt. Form. Colo. *540*; Brenckle, Fungi Dak. *72*; Rab.-Wint. Fungi Eur. *3628a, b, 3629a, b*.

44. **Nigredo intricata** (Cooke) Arthur.

Uromyces intricatus Cooke, Grevillea **7**: 3. 1878.
Uromyces Chorizanthis Ellis & Hark. Bull. Calif. Acad. **1**: 28. 1884.
Uromyces Eriogoni Ellis & Hark. Bull. Calif. Acad. **1**: 29. 1884.
Uromyces arizonicus Tracy & Gall. Jour. Myc. **4**: 20. 1888.
Uromyces Gnaphalii Ellis & Ev. Erythea **1**: 204. 1893.
Caeomurus arizonicus Kuntze, Rev. Gen. 3^3: 449. 1898.
Caeomurus Chorizanthis Kuntze, Rev. Gen. 3^3: 449. 1898.
Caeomurus Eriogoni Kuntze, Rev. Gen. 3^3: 450. 1898.
Caeomurus Gnaphalii Kuntze, Rev. Gen. 3^3: 450. 1898.
Caeomurus intricatus Kuntze, Rev. Gen. 3^3: 450. 1898.
Nigredo Chorizanthis Arth. Résult. Sci. Congr. Bot. Vienne 343. 1906.

O. Pycnia epiphyllous, gregarious, in small groups 0.4–0.6 mm. across, not conspicuous, honey-yellow becoming somewhat darker with age, globoid, 112–128 μ in diameter by 100–112 μ high; ostiolar filaments 65–80 μ long.

I. Aecia hypophyllous, gregarious, in circular groups 1–2 mm. across, crowded, usually short, sometimes somewhat elongate, small, about 0.2–0.3 mm. in diameter; peridium colorless, the margin finely dentate; peridial cells rhomboidal, 28–35 μ long, the outer wall rather thick, 7–9 μ, transversely striate, the inner wall somewhat thinner, 3–5 μ, somewhat striate, moderately rugose; aeciospores globoid, 16–22 by 19–24 μ; wall pale-yellow or colorless, thin, 1 μ, finely verrucose.

II. Uredinia chiefly epiphyllous, scattered irregularly, or occasionally in annular groups 2–3 mm. across, roundish, 0.5–0.8 mm. across, soon naked, pulverulent, slightly pulvinate, light chestnut-brown, ruptured epidermis not conspicuous; urediniospores broadly ellipsoid or obovoid, 20–25 by 26–33 μ; wall dark golden-brown, 1.5–2.5 μ thick, rather sparsely and moderately echinulate, the pores 3–6, rarely as many as 8, scattered.

III. Telia amphigenous, scattered irregularly, or occasionally in annular groups, 1.5–2.5 mm. across, roundish or oval, 0.5–1 mm. across, early naked, pulvinate, chocolate-brown, ruptured epidermis somewhat noticeable; teliospores obovoid, broadly ellipsoid or globoid, 20–27 by 24–35 μ, usually narrrowed below, obtuse or truncate above; wall cinnamon-brown, slightly darker above, moderately thin, 1.5–2 μ, thicker at apex, 5–9 μ, smooth; pedicel colorless, two to three times length of spore.

ON POLYGONACEAE:

Chorizanthe pungens Benth., California.
Chorizanthe robusta Parry, California.
Eriogonum campanulatum Nutt., Colorado, Utah.
Eriogonum cernuum Nutt., California.
Eriogonum compositum Dougl., Idaho, Washington.
Eriogonum croceum Small, Idaho.
Eriogonum dichotomum Dougl., Washington.
Eriogonum dumosum Greene, California.
Eriogonum effusum Nutt., Colorado, Idaho, Wyoming.
Eriogonum elongatum Benth., California.
Eriogonum fasciculatum Benth., California.
Eriogonum flavum Nutt., Colorado, Montana.
Eriogonum heracleoides Nutt., Idaho, Utah, Washington.
Eriogonum Kennedyi Porter, Nevada.
Eriogonum latifolium Smith, California.
Eriogonum lonchophyllum T. & G., Colorado.
Eriogonum microthecum Nutt., Montana, Wyoming.
Eriogonum multiceps Nees, Nebraska.
Eriogonum nudum Dougl., California.
Eriogonum nudum pauciflorum S. Wats., California.
Eriogonum orendense A. Nels., Wyoming.
Eriogonum ovale Small, Montana.
Eriogonum parvifolium Smith, California.
Eriogonum pauciflorum Pursh, Colorado.
Eriogonum polyanthum Benth., Arizona, Nevada.
Eriogonum racemosum Nutt., Arizona, Colorado.
Eriogonum scoparium Small, Colorado.
Eriogonum subalpinum Greene, Colorado.
Eriogonum umbellatum Torr., Colorado, Montana, Oregon, Utah, Wyoming.
Eriogonum vimineum Dougl., California, Oregon.
Eriogonum virgatum Benth., California, Oregon.

TYPE LOCALITY: California, on "*Gayophytum ramosissimum*," error for *Eriogonum* sp.

DISTRIBUTION: Throughout the Rocky Mountain region of the United States and westward to the Pacific coast.

EXSICCATI: Garrett, Fungi Utah. *12*, *13*, *120*, *147*, *174*, *196*; Sydow, Ured. *1756*, *1757*, *1758*; Ellis, N. Am. Fungi *1069*; Ellis & Ev. N. Am. Fungi *1871*, *2232*, *2232b*; Ellis & Ev. Fungi Columb. *480*, *1470*, *1693*; Clements, Crypt. Form. Colo. *530*; Barth. Fungi Columb. *2292*, *3591*; Rab.-Wint. Fungi Eur. *3626*; Rab.-Wint.-Paz. Fungi Eur. *3923*.

45. **Nigredo Betae** (Pers.) Arth. Résult. Sci. Congr. Bot. Vienne 343. 1906.

Uredo Betae Pers. Syn. Fung. 220. 1801.
Uredo cincta β *Betae* Strauss, Ann. Wett. Ges. **2**: 96. 1810.
Caeoma Betarum Link, in Willd. Sp. Pl. 6^2: 11. 1825.
Uromyces Betae Lév. Ann. Sci. Nat. III. **8**: 375. 1847.
Trichobasis Betae Lév.; Cooke, Micros. Fungi 209. 1865.
Aecidium Betae Kühn, Zeitschr. Landw. Central-Ver. Sachs. **26**: 41. 1869.
Caeomurus Betae Kuntze, Rev. Gen. 3^3: 449. 1898.

O. Pycnia amphigenous, gregarious, yellowish becoming brownish, depressed-globoid, 128–160 μ in diameter by 80–100 μ high; ostiolar filaments 35–50 μ long.

I. Aecia amphigenous, gregarious, in crowded or annular groups 3–5 mm. across, short, cupulate, 0.3–0.4 mm. in diameter; peridium colorless, the margin erose; peridial cells rhomboidal or rhombic, 26–34 μ long, the outer and inner walls of about equal thickness, 5–7 μ, inconspicuously striate, the inner wall finely verrucose; aeciospores globoid, 19–24 by 23–26 μ; wall colorless, 1.5–2 μ thick, finely verrucose.

II. Uredinia amphigenous, scattered, rupturing rather early, somewhat pulverulent, cinnamon-brown, ruptured epidermis conspicuous; urediniospores broadly ellipsoid or obovoid, 19–23 by 26–33 μ; wall golden-brown, about 2 μ thick, rather sparsely echinulate with low blunt points, the pores 3 or 4, equatorial.

III. Telia amphigenous, scattered, rupturing rather early, slightly pulverulent, somewhat pulvinate, chestnut-brown, ruptured epidermis conspicuous; teliospores broadly

ellipsoid or obovate-ellipsoid, 18–21 by 26–30 μ; wall dark golden-brown, 1.5–2 μ thick, thicker above, 4–5 μ, with a small hyaline papilla over the germ-pore; pedicel hyaline, shorter than the spore.

ON CHENOPODIACEAE:
Beta vulgaris L., California.
TYPE LOCALITY: Europe, on *Beta vulgaris*.
DISTRIBUTION: The southern half of California, only found in the sporophytic phase; also in Europe, southern Africa, and Australia.
ILLUSTRATIONS: Beitr. Krypt. Schweiz 2^2: *f. 9;* McAlpine, Rusts Austr. *pl. H, f. 35; pl. 17, f. 148, 149.*
EXSICCATI: Ellis & Ev. N. Am. Fungi *2229;* Seym. & Earle, Econ. Fungi *448.*

46. **Nigredo (?) Celosiae** (Dietel & Holway) Arthur.

Uromyces Celosiae Dietel & Holway; Holway, Bot. Gaz. **31**: 326. 1901.

O and I. Pycnia and aecia unknown.

II. Uredinia hypophyllous, scattered, on large irregular areas, sometimes crowded and occasionally confluent, roundish, 0.2–0.5 mm. in diameter, early naked, pulverulent, dark cinnamon-brown, ruptured epidermis conspicuous; urediniospores broadly ellipsoid, 19–26 by 24–32 μ; wall cinnamon-brown, 2–3.5 μ thick, strongly and sparsely echinulate, the pores distinct, 2, equatorial.

III. Telia hypophyllous, scattered in large irregular areas, often crowded and occasionally confluent, roundish or oval, 0.2–0.6 mm. in diameter, rather early naked, pulverulent, chocolate-brown or blackish, ruptured epidermis conspicuous; teliospores globoid to broadly ellipsoid, 23–29 by 27–34 μ; wall chocolate-brown, thick, 3–5 μ, inconspicuously and closely verrucose, thickened above by a broad pale umbo, 7–9 μ thick; pedicel rather stout, colorless, slightly roughened below, once to twice length of spore.

AMARANTHACEAE:
Iresine latifolia Benth. & Hook., Oaxaca; Guatemala.
Iresine paniculata Poir., Morelos.
Iresine Pringlei S. Wats., Pueblo.
TYPE LOCALITY: Oaxaca, Mexico, on "*Celosia latifolia*," error for *Iresine latifolia*.
DISTRIBUTION: Southern Mexico and Guatemala.
EXSICCATI: Sydow, Ured. *1852.*

47. **Nigredo caryophyllina** (Schrank.) Arthur.

Lycoperdon caryophyllinum Schrank, Baier. Fl. **2**: 668. 1789.
Uredo Dianthi Pers. Syn. Fung. 222. 1801.
Caeoma Dianthi Link, in Willd. Sp. Pl. 6^2: 26. 1825.
Uromyces Dianthi Niessl, Verh. Nat. Ver. Brünn 10^2: 162. 1872.
Uromyces caryophyllinus Wint. in Rab. Krypt. Fl. 1^1: 149. 1881.
Caeomurus caryophyllinus Kuntze, Rev. Gen. 3^3: 449. 1898.
Uredo dianthicola Hariot, Jour. de Bot. **14**: 116. 1900.
Aecidium Euphorbiae-Gerardianae Ed. Fisch. Beitr. Krypt. Schweiz 2^2: 530. 1904.

O. Pycnia hypophyllous, scattered, abundant on the lower leaves, from diffused mycelium, punctiform, conspicuous, honey-yellow becoming brownish, in section globoid, 130–160 μ in diameter; ostiolar filaments strongly developed, 40–85 μ long.

I. Aecia hypophyllous, scattered thickly over the surface of the upper leaves, from diffused mycelium causing a slight general hypertrophy, round or somewhat oval, 0.3–0.5 mm. across, orange-yellow when fresh; peridium colorless, short, the margin erect or slightly recurved, coarsely erose; peridial cells in radial section quadratish, 19–25 μ in length and breadth, abutted, with slight overlapping projection at outer edge, the outer wall very thick, 7–10 μ, flat, transversely striate, smooth but appearing finely punctate, the inner wall much thinner, 3–5 μ, projecting in a half circle, strongly and thickly verrucose; aeciospores angularly globoid, 16–22 μ in diameter; wall nearly or quite colorless, very thin, 1 μ or less, finely and closely verrucose.

ON EUPHORBIACEAE:
Euphorbia Gerardiana Jacq., only in Europe.

II. Uredinia amphigenous, scattered or often in loose groups, oval or irregular, often confluent, rather large, 0.5–1.5 mm. across, rather tardily naked, pulverulent, dark cinnamon-brown, ruptured epidermis conspicuous; urediniospores broadly ellipsoid, 20–24 by 24–30 μ; wall golden-brown, rather thick, 2.5–3 μ, closely and strongly echinulate, the pores 3 or 4, equatorial.

III. Telia amphigenous, scattered or more or less gregarious, roundish, oval, or irregular and confluent, equaling the uredinia in size, rather early naked, somewhat pulverulent, chestnut-brown, ruptured epidermis conspicuous; teliospores ellipsoid, 19–23 by 25–29 μ, usually roundish above and below; wall light chestnut-brown, rather thick, about 3 μ, with a low hyaline papilla over the germ-pore, very finely verrucose, appearing nearly or quite smooth when wet; pedicel colorless, short.

ON CARYOPHYLLACEAE:
Dianthus barbatus L., Nebraska.
Dianthus Caryophyllus L., Colorado, Indiana, Iowa, Kansas, Maine, Maryland, Massachusetts, Michigan, Nebraska, Ohio, Pennsylvania, South Dakota, Texas, Utah, Wisconsin; Ontario.
Dianthus chinensis L. (*D. sinensis* Hort.), Nebraska.
Dianthus pelviformis Heuffel, Nebraska.

TYPE LOCALITY: Bavaria, on "Gartennelke" [*Dianthus barbatus*].

DISTRIBUTION: Chiefly in greenhouses throughout the temperate portions of North America, especially in the northern states and only in the sporophytic phase; also in Europe and Japan.

ILLUSTRATIONS: Beitr. Krypt. Schweiz 2^2: *f. 10, 11;* McAlpine, Rusts Austr. *pl. G, f. 30, 31; pl. 18, f. 152, 153.*

EXSICCATI: Kellerm. Ohio Fungi *35;* Ellis & Ev. N. Am. Fungi *3342;* Ellis & Ev. Fungi Columb. *2182;* Barth. Fungi Columb. *2795;* Seym. & Earle, Econ. Fungi *460.*

48. **Nigredo Silenes** (Schlecht.) Arthur.

Caeoma Silenes Schlecht. Fl. Berol. **2**: 128. 1824.
Erysibe Silenes Wallr. Fl. Crypt. Germ. **2**: 206. 1833.
Uromyces inaequialtus Lasch; Rab. Fungi Eur. *94.* 1859.
Uromyces Silenes Fuckel, Symb. Myc. 61. 1869.
Aecidium sparsum Hazsl. Math. Termész. Közl. **14**: 136. 1877.
Uromyces pulchellus Ellis & Ev. Bull. Torrey Club **22**: 57. 1895.
Caeomurus Silenes Kuntze, Rev. Gen. 3^3: 450. 1898.
Caeomurus pulchellus Kuntze, Rev. Gen. 3^3: 450. 1898.

O. Pycnia amphigenous, few, in small groups, inconspicuous, yellowish becoming brownish, depressed-globoid, 110–140 μ in diameter by 75–110 μ high; ostiolar filaments 65–80 μ long.

I. Aecia hypophyllous, in crowded groups 1.5–3 mm. across, short, cupulate, 0.3–0.4 mm. in diameter; peridium colorless, the margin erose; peridial cells rhomboidal, 15–18 by 21–30 μ, the outer wall rather thick, 6–9 μ, transversely striate, the inner wall thinner, 2–3 μ, somewhat striate, moderately verrucose; aeciospores globoid, 15–19 by 18–23 μ; wall light-yellow or colorless, 1.5–2 μ thick, finely verrucose.

II. Uredinia amphigenous, solitary or occasionally in annular groups, roundish or oblong, 0.5–1 mm. across, rather early naked, somewhat pulverulent, cinnamon-brown, ruptured epidermis conspicuous; urediniospores globoid or broadly ellipsoid, 18–23 by 22–27 μ; wall cinnamon-brown, moderately thick, 1.5–2.5 μ, evenly and moderately verrucose, the pores 3, approximately equatorial.

III. Telia amphigenous, usually in annular groups, 2–4 mm. across, roundish, 0.4–0.8 mm. across, early naked, pulvinate, dark chocolate-brown, ruptured epidermis not conspicuous; teliospores broadly ellipsoid or obovoid, 19–23 by 25–32 μ; wall light chocolate-brown, 1.5–2.5 μ thick, thicker above with a lighter umbo, 5–9 μ, smooth; pedicel tinted, once to twice length of spore.

ON CARYOPHYLLACEAE:
Silene Douglasii multicaulis (Nutt.) B. L. Robinson, Washington.
Silene nivea (Nutt.) Otth, Iowa, Kansas.

TYPE LOCALITY: Berlin, Germany, on *Silene chlorantha.*

DISTRIBUTION: Local from Iowa to Washington; also in Europe.

ILLUSTRATION: Beitr. Krypt. Schweiz 2^2: *f. 43.*

49. **Nigredo Lespedezae-procumbentis** (Schw.) Arth. Résult. Sci. Congr. Bot. Vienne 344. 1906.

Puccinia Lespedezae-procumbentis Schw. Schr. Nat. Ges. Leipzig **1**: 73. 1822.
Puccinia Lespedezae-polystachyae Schw. Schr. Nat. Ges. Leipzig **1**: 73. 1822.
Puccinia Lespedezae Spreng. Syst. **4**: 568. 1827.
Puccinia Lespedezae-violaceae Schw. Trans. Am. Phil. Soc. II. **4**: 296. 1832.
Uromyces Lespedezae-procumbentis M. A. Curt. Cat. Pl. N. Car. 123. 1867.
Aecidium Orobi leucostictum Berk. Grevillea **3**: 61. 1874.
Uredo Lespedezae Thüm. Myc. Univ. *643.* 1877.

Uromyces Lespedezae Peck; Coulter, Bot. Bull. [Bot. Gaz.] 1: 20. 1878.
Aecidium leucostictum Berk. & Curt.; Burrill, Bull. Ill. Lab. Nat. Hist. 2: 226. 1885.
Caeomurus Lespedezae Kuntze, Rev. Gen. 3³: 450. 1898.
Caeomurus Lespedezae-procumbentis Arth. Proc. Ind. Acad. Sci. 1898: 180. 1899.

O. Pycnia epiphyllous, in small groups about 0.5 mm. across, punctiform, minute, inconspicuous, yellowish, flattened-globoid, 80–98 μ in diameter by 64–74 μ high; ostiolar filaments 25–40 μ long.

I. Aecia hypophyllous, in small groups 1–1.5 mm. across, on discolored spots, short, cupulate, 0.1–0.2 mm. in diameter; peridium pale-yellow or white, the margin revolute, lacerate; peridial cells rhomboidal, 19–25 μ long, the outer wall rather thick, 4–7 μ, transversely striate, the inner wall thinner, 3–4 μ, moderately verrucose, somewhat striate; aeciospores globoid, 11–15 by 13–16 μ; wall colorless, thin, 1 μ, minutely verrucose.

II. Uredinia hypophyllous, scattered, roundish, small, about 0.2–0.3 mm. across, rather tardily naked, pale cinnamon-brown, pulverulent, ruptured epidermis conspicuous; paraphyses encircling the sori, strongly incurved, cylindrical to slender-clavate, 10–12 by 45–58 μ, the wall pale-yellowish, thick, smooth; urediniospores broadly ellipsoid or obovate-ellipsoid, 13–18 by 16–23 μ; wall pale golden-brown, rather thin, 1–1.5 μ, rather obscurely and sparsely echinulate, the pores 3 or 4, approximately equatorial.

III. Telia amphigenous, scattered, roundish or oval, 0.3–1 mm. across, rather tardily naked, compact, pulvinate, blackish-brown, ruptured epidermis evident; paraphyses similar to those in the uredinia, usually present but less abundant; teliospores ovoid, oblong or oblong-clavate, 12–16 by 18–32 μ, rounded or obtuse at the apex, obtuse or usually narrowed below; wall smooth, dark chestnut-brown, 1.5 μ thick, the apex much thickened, 5–10 μ or more, slightly paler above; pedicel colorless, once to once and a half length of spore.

ON FABACEAE:

Lespedeza angustifolia (Pursh) Ell., Connecticut, Virginia.
Lespedeza capitata Michx., Alabama, Connecticut, Illinois, Indiana, Iowa, Kansas, Massachusetts, Minnesota, Mississippi, Nebraska, New Jersey, New York, North Carolina, Vermont, Wisconsin; Ontario.
Lespedeza frutescens (L.) Britton (*L. reticulata* S. Wats. not Pass., *L. intermedia* Britton), Alabama, Arkansas, Delaware, Kentucky, Massachusetts, New York, North Carolina, Pennsylvania, Tennessee, Texas, West Virginia.
Lespedeza hirta (L.) Hornem. (*L. polystachya* Michx.), Alabama, Delaware, Florida, Illinois, Indiana, Massachusetts, New York, Ohio, Pennsylvania, South Carolina, West Virginia.
Lespedeza leptostachya Engelm., Iowa.
Lespedeza Nuttallii Darl., Kentucky, New York.
Lespedeza procumbens Michx., Alabama, Arkansas, Illinois, Indiana, Kentucky, Massachusetts, Missouri, New Jersey, North Carolina, Rhode Island, West Virginia.
Lespedeza repens (L.) Bart., Alabama, District of Columbia, Illinois, Maryland, Mississippi, Missouri, South Carolina, West Virginia.
Lespedeza Stuvei Nutt., Alabama, Arkansas, Maryland, Massachusetts, Missouri, North Carolina, Tennessee.
Lespedeza texana Britton, Texas.
Lespedeza violacea (L.) Pers., Illinois, Louisiana, Mississippi, Missouri, New York, Ohio, South Carolina, West Virginia, Wisconsin.
Lespedeza virginica (L.) Britton (*L. reticulata* Pers., *L. sessiliflora* Michx., *L. violacea angustifolia* T. & G.), Alabama, Arkansas, Delaware, District of Columbia, Illinois, Indiana, Kentucky, Missouri, Oklahoma, Pennsylvania, South Carolina.

TYPE LOCALITY: North Carolina, on *Lespedeza procumbens*.

DISTRIBUTION: Vermont to Minnesota, and southward to Florida and Texas; also in Japan and northeastern Asia.

EXSICCATI: Ellis, N. Am. Fungi *245;* Ellis & Ev. N. Am. Fungi *1827;* Ellis & Ev. Fungi Columb. *1697, 1698;* Barth. Fungi Columb. *2493, 2596, 2797, 2896, 2897, 2898, 2992, 2993;* Barth. N. Am. Ured. *94, 194;* Kellerm. Ohio Fungi *39, 198;* Sydow, Ured. *306, 2358;* Rav. Fungi Car. **4**: *92;* Rav. Fungi Am. *494;* Thüm. Myc. Univ. *643, 1528;* Rab.-Wint.-Paz. Fungi Eur. *3929;* Seym. & Earle, Econ. Fungi *274;* Roum. Fungi Gall. *4507;* Vesterg. Micr. Rar. Sel. *447*.

50. **Nigredo Hedysari-paniculati** (Schw.) Arth. Résult. Sci. Congr. Bot. Vienne 343. 1906.

Puccinia Hedysari-paniculati Schw. Schr. Nat. Ges. Leipzig 1: 74. 1822.
Phragmidium Hedysari Schw. Trans. Am. Phil. Soc. II. 4: 297. 1832.
Uromyces solidus Berk. & Curt. Grevillea 3: 57. 1874.
Uromyces Desmodii Cooke, Hedwigia 17: 39. Mr 1878.
Uromyces Desmodii Thüm. Bull. Torrey Club 6: 215. Mr 1878.
Uromyces Hedysari-paniculati Farl.; Ellis, N. Am. Fungi *246*. 1879.
Aecidium Desmodii P. Henn. Hedwigia 35: 259. 1896.

Caeomurus Desmodii Kuntze, Rev. Gen. 3³ : 449. 1898.
Caeomurus Hedysari-paniculati Arth. Proc. Ind. Acad. Sci. 1898 : 180. 1899.
Uredo Desmodii-leiocarpi P. Henn. Hedwigia 41 : 107. 1902.
Uromyces Desmodii-leiocarpi P. Henn. Hedwigia 48 : 1. 1908.

O. Pycnia epiphyllous, in small groups on discolored spots, punctiform, small, rather inconspicuous, flattened-globoid, 82–110 μ in diameter by 65–80 μ high ; ostiolar filaments 25–30 μ long.

I. Aecia hypophyllous, loosely arranged in small irregular or annular groups, short, cupulate, small, 0.1–0.2 mm. in diameter ; peridium somewhat recurved, the margin lacerate ; aeciospores globoid, 21–24 by 22–27 μ ; wall colorless, thin, about 1–1.5 μ, finely verrucose.

II. Uredinia chiefly hypophyllous, scattered, small, roundish, 0.5 mm. or less in diameter, soon naked, pulverulent, light cinnamon-brown, ruptured epidermis noticeable ; paraphyses rather few, encircling the sorus, very inconspicuous, delicate, clavate, 9–12 by 25–30 μ, the wall very thin, nearly colorless ; urediniospores broadly ellipsoid or obovate-ellipsoid, 17–24 by 19–26 μ ; wall golden-brown, 1.5 μ thick, evenly and finely echinulate, the pores 3–5, scattered.

III. Telia chiefly hypophyllous, scattered, sometimes aggregated and confluent, roundish or oval, 0.4–0.8 mm. in diameter, soon naked, pulvinate, somewhat pulverulent, blackish-brown, ruptured epidermis inconspicuous ; teliospores ovoid or ellipsoid, 15–20 by 19–29 μ, obtuse or rounded at both ends ; wall dark chestnut- or chocolate-brown, thick, 2.5–3 μ, the apex somewhat thicker, 4–7 μ, concolorous or semihyaline, conspicuously verrucose ; pedicel hyaline or nearly so, about twice length of spore.

ON FABACEAE :
Meibomia amplifolia (Hemsl.) Kuntze (*Desmodium amplifolium* Hemsl.), Michoacan.
Meibomia bracteosa (Michx.) Kuntze (*Desmodium cuspidatum* Hook.), Illinois.
Meibomia canadensis (L.) Kuntze (*Desmodium canadense* DC.), Iowa, New Jersey, New York.
Meibomia canescens (L.) Kuntze (*Desmodium canescens* DC.), Connecticut, Illinois, Indiana, Kansas, Mississippi, Missouri, North Carolina, Ohio, South Carolina, West Virginia.
Meibomia Dillenii (Darl.) Kuntze (*Desmodium Dillenii* Darl.), Alabama, Arkansas, Delaware, Indiana, Iowa, Louisiana, Mississippi, Missouri, Nebraska, North Carolina, Pennsylvania, Wisconsin ; Ontario.
Meibomia elegans (Desv.) Kuntze (*Desmodium elegans* DC.), Mexico (state), Oaxaca.
Meibomia grandiflora (Walt.) Kuntze (*Desmodium acuminatum* DC.), Kansas, Minnesota.
Meibomia illinoensis (A. Gray) Kuntze (*Desmodium illinoense* A. Gray), Illinois, Kansas.
Meibomia laevigata (Nutt.) Kuntze (*Desmodium laevigatum* DC., *D. rhombifolium* DC.), Delaware, Florida, Indiana, North Carolina.
Meibomia marilandica (L.) Kuntze (*Desmodium marilandicum* Boott), Alabama, Delaware, New Jersey, North Carolina.
Meibomia Michauxii Vail (*Desmodium rotundifolium* DC.), Alabama, Illinois, New Jersey, New York.
Meibomia obtusa (Muhl.) Vail (*Desmodium ciliare* DC.), Mississippi, New Jersey, North Carolina, South Carolina.
Meibomia paniculata (L.) Kuntze (*Desmodium paniculatum* DC., *Hedysarum paniculatum* L.), Alabama, Arkansas, Delaware, Illinois, Indiana, Kansas, Kentucky, Michigan, Mississippi, Missouri, New Jersey, New York, North Carolina, Ohio, Pennsylvania, South Carolina, Texas, West Virginia.
Meibomia pauciflora (Nutt.) Kuntze (*Desmodium pauciflorum* DC.), Arkansas.
Meibomia rigida (Ell.) Kuntze (*Desmodium rigidum* DC.), Mississippi, New York.
Meibomia sessilifolia (Torr.) Kuntze (*Desmodium sessilifolium* T. & G.), Iowa, Kansas.
Meibomia stricta (Pursh) Kuntze (*Desmodium strictum* DC.), Alabama, North Carolina, South Carolina.
Meibomia strobilacea (Schlecht.) Kuntze (*Desmodium strobilaceum* Schlecht.), Jalisco.
Meibomia viridiflora (L.) Kuntze (*Desmodium viridiflorum* Beck), Florida, Indiana, Ohio.
Meibomia sp., Morelos.

TYPE LOCALITY : North Carolina, on *Hedysarum paniculatum*.

DISTRIBUTION : New York to Minnesota and Nebraska, and southward to the coast, and throughout southern Mexico ; also in South America.

EXSICCATI : Kellerm. Ohio Fungi *37*, *99*, *197* ; Ellis & Ev. Fungi Columb. *254* ; Barth. Fungi Columb. *2393*, *2696*, *2894*, *2895*, *2990*, *3091*, *3092*, *3395*, *3592* ; Barth. N. Am. Ured. *191* ; Ellis, N. Am. Fungi *246* ; Rab.-Wint.-Paz. Fungi Eur. *3926* ; Rav. Fungi Am. *49*, *493* ; Sydow, Ured. *254*, *1358*, *2007*, *2008*, *2009*, *2104* ; Carleton, Ured, Am. *19* ; Thüm. Myc. Univ. *946*.

51. **Nigredo mexicana** (Dietel & Holway) Arthur.

Uromyces mexicanus Dietel & Holway; Holway, Bot. Gaz. **24**: 24. 1897.

O and I. Pycnia and aecia unknown.

II. Uredinia hypophyllous, more or less gregarious and crowded, roundish, 0.3–0.5 mm. across, soon naked, cinnamon-brown, pulverulent, ruptured epidermis noticeable; urediniospores broadly ellipsoid or globoid, 17–21 by 19–26 μ; wall thin, 1–1.5 μ, golden-brown, inconspicuously and rather sparsely echinulate, the pores 3 or 4, approximately equatorial.

III. Telia chiefly caulicolous, oblong or linear, often confluent, early naked, pulvinate, firm, blackish, ruptured epidermis usually inconspicuous; teliospores ellipsoid or ovoid, 18–23 by 21–28 μ, often somewhat narrowed above; wall dark chestnut-brown, thick, 2.5–3.5 μ, thicker above, 5–7 μ, with a somewhat paler umbo, very inconspicuously verruculose, appearing smooth when wet; pedicel colorless, or slightly tinted next the spore, slender, 6–8 μ in diameter next the spore, becoming more slender below, two to four times the length of spore.

ON FABACEAE:
Meibomia sp. (*Desmodium* sp.), Hidalgo, Jalisco, Mexico (state), Morelos, San Luis Potosi.
TYPE LOCALITY: City of Mexico, Mexico, on *Desmodium* sp.
DISTRIBUTION: Central and southern Mexico.

52. **Nigredo tenuistipes** (Dietel & Holway) Arthur.

Uromyces tenuistipes Dietel & Holway; Holway, Bot. Gaz. **24**: 25. 1897.

O and I. Pycnia and aecia unknown.

II. Uredinia chiefly hypophyllous, more or less gregarious and crowded, roundish, 0.3–0.5 mm. across, soon naked, cinnamon-brown, pulverulent, ruptured epidermis noticeable; urediniospores globoid or somewhat ellipsoid, 18–23 by 19–25 μ; wall golden-brown, 1.5–2 μ thick, inconspicuously and closely verrucose-echinulate, the pores 3 or 4, approximately equatorial.

III. Telia chiefly hypophyllous, scattered, roundish, 0.5–1 mm. across, soon naked, blackish, pulverulent, ruptured epidermis inconspicuous; teliospores globose or somewhat ellipsoid, 20–24 by 23–27 μ; wall dark chestnut-brown, thick, 3–4 μ, minutely verruculose, appearing almost smooth when wet, the apex usually with a broad and very low pale umbo; pedicel colorless, slender, tapering below, usually remaining, three to five times the length of spore.

ON FABACEAE:
Meibomia strobilacea (Schlecht.) Kuntze (*Desmodium strobilaceum* Schlecht.), Jalisco, Mexico (state), San Luis Potosi.
TYPE LOCALITY: Eslava, near City of Mexico, Mexico, on *Desmodium* sp.
DISTRIBUTION: Central and southern Mexico.
EXSICCATI: Sydow, Ured. *1512*.

53. **Nigredo Indigoferae** (Dietel & Holway) Arthur.

Uromyces Indigoferae Dietel & Holway; Holway, Bot. Gaz. **31**: 328. 1901.

O and I. Pycnia and aecia unknown.

II. Uredinia amphigenous, scattered, roundish, small, 0.3–0.5 mm. across, early naked, somewhat pulverulent, slightly pulvinate, ruptured epidermis not noticeable; urediniospores ellipsoid or subgloboid, 15–19 by 19–25 μ; wall cinnamon-brown, 1.5–2 μ thick, rather finely echinulate, the pores 3, equatorial.

III. Telia amphigenous, scattered, similar to the uredinia in shape and size, early naked, compact, pulvinate, blackish-brown, ruptured epidermis not noticeable; teliospores broadly ellipsoid or subglobose, 17–23 by 22–29 μ, usually rounded above and below; wall chestnut-brown, thick, 2.5–3.5 μ, thicker and somewhat lighter at apex, 7–10 μ, smooth; pedicel hyaline, once to twice length of spore.

ON FABACEAE:
Indigofera leptosepala Nutt., Texas.
Indigofera mexicana Benth., Oaxaca.
Indigofera mucronata Spreng., Guatemala.

TYPE LOCALITY: Oaxaca, Mexico, on *Indigofera mexicana*.
DISTRIBUTION: Northern Texas, southward into Central America.

54. **Nigredo Fabae** (Pers.) Arthur.

Uredo Fabae Pers. Neues Mag. Bot. 1: 93. 1794.
Uredo Viciae-Fabae Pers. Syn. Fung. 221. 1801.
Uredo Viciae Rebent. Prodr. Fl. Neom. 355. 1804.
Caeoma Leguminosarum Schlecht. Fl. Berol. 2: 127. 1824.
Uromyces appendiculatus Ung. Einfl. Bodens 216. 1836.
Uromyces Fabae DeBary, Ann. Sci. Nat. IV. 20: 80. 1863.
Uromyces Viciae Fuckel, Symb. Myc. 62. 1869.
Aecidium album G. W. Clinton; Peck, Ann. Rep. N. Y. State Mus. 26: 78. 1874.
Uromyces polymorphus Peck & Clinton; Peck, Ann. Rep. N. Y. State Mus. 31: 43. 1879.
Caeomurus Fabae Kuntze, Rev. Gen. 3^3: 450. 1898.
Caeomurus polymorphus Kuntze, Rev. Gen. 3^3: 450. 1898.

O. Pycnia chiefly epiphyllous, in small groups about 0.5 mm. across, few, inconspicuous, honey-yellow, globoid, 98–130 μ in diameter by 80–115 μ high; ostiolar filaments 40–55 μ long.

I. Aecia chiefly hypophyllous, in small crowded groups 1–1.5 mm. across, short, cupulate, 0.1–0.2 mm. in diameter; peridium whitish, somewhat revolute, finely lacerate; peridial cells rhomboidal, 25–30 μ long, the outer wall rather thick, 6–9 μ, transversely striate, the inner wall thinner, 3–4 μ, somewhat striate, moderately verrucose; aeciospores broadly ellipsoid, 15–21 by 18–26 μ; wall colorless, thin, 1–1.5 μ, finely verrucose.

II. Uredinia amphigenous, scattered, roundish, 0.3–0.8 mm. across, early naked, pulverulent, cinnamon-brown, ruptured epidermis evident; urediniospores broadly ellipsoid or obovate-ellipsoid, 17–25 by 22–30 μ; wall light golden-brown, 1.5–2 μ, evenly and sparsely echinulate, the pores 3 or 4, scattered or often appearing approximately equatorial.

III. Telia amphigenous, scattered, roundish or elongate, 0.4–1.5 mm. or more across, rather soon naked, firm, pulvinate, blackish-brown, ruptured epidermis evident; teliospores ellipsoid, subgloboid or ovoid, 18–25 by 25–39 μ, the apex rounded or truncate, the base obtuse or narrowed; wall dark chestnut-brown, 1.5–2.5 μ, much thicker above, 6–10 μ, smooth; pedicel tinted next to the spore, firm, persistent, once to twice length of spore.

ON FABACEAE:
Lathyrus arizonicus Britton, Colorado.
Lathyrus bijugatus T. G. White, Washington.
Lathyrus Bolanderi S. Wats., California.
Lathyrus coriaceus T. G. White, Utah.
Lathyrus decaphyllus Pursh (*L. polymorphus* Nutt.), Colorado.
Lathyrus laetivirens Greene, Colorado.
Lathyrus leucanthus Rydb., Colorado, New Mexico.
Lathyrus myrtifolius Muhl., Illinois, Iowa; Ontario.
Lathyrus ochroleucus Hook., Illinois, New York, Utah, Wisconsin; Ontario.
Lathyrus oregonensis T. G. White, Oregon.
Lathyrus ornatus Nutt., Colorado, Kansas, Nebraska.
Lathyrus pauciflorus Fernald (*L. Shaffneri* Rydb., *L. parvifolius* S. Wats.), Idaho, Montana.
Lathyrus polyphyllus Nutt., Oregon, Washington.
Lathyrus strictus Nutt., California.
Lathyrus sulphureus Brewer, Washington.
Lathyrus Torreyi A. Gray, California.
Lathyrus utahensis M. E. Jones, Utah.
Lathyrus venosus Muhl., Indiana, Iowa, Michigan, Minnesota, South Dakota, Wisconsin.
Lathyrus violaceus Greene (*L. puberulus* T. G. White), California.
Lathyrus Watsonii T. G. White, California.
Vicia americana Muhl., Iowa, Montana, New York, Ohio, South Dakota, Washington, Wyoming.
Vicia Cracca L., Nova Scotia.
Vicia dissitifolia (Nutt.) Rydb., Colorado.
Vicia Faba L. (*Faba vulgaris* Moench), Louisiana; Mexico (state), Michoacan, Oaxaca.
Vicia linearis (Nutt.) Greene, Kansas.

TYPE LOCALITY: Europe, on *Vicia Faba*.
DISTRIBUTION: Nova Scotia to Louisiana, westward to the Pacific coast, and southward to southern Mexico; also in Europe and Asia.
ILLUSTRATIONS: Beitr. Krypt. Schweiz 2^2: *f. 49, 50, 51;* McAlpine, Rusts Austr. *pl. 42, f. 307.*
EXSICCATI: Kellerm. Ohio Fungi *2;* Ellis, N. Am. Fungi *1442;* Sydow, Ured. *1353, 1764;* D. Griff. W. Am. Fungi *260, 300, 349, 349a;* Garrett, Fungi Utah. *123, 124, 125;* Ellis & Ev. Fungi Columb. *1993;* Barth. Fungi Columb. *3194;* Clements, Crypt. Form. Colo. *532.*

55. **Nigredo Lupini** (Berk. & Curt.) Arth. Résult. Sci. Congr. Bot. Vienne 344. 1906.

Uredo Lupini Berk. & Curt. Proc. Am. Acad. 4: 126. 1858.
Uromyces Lupini Berk. & Curt. Proc. Am. Acad. 4: 126. 1858.
Uromyces tomentellus Cooke, Grevillea 6: 138. 1878.
Uromyces Astragali Lupini De-Toni, in Sacc. Syll. Fung. 7: 550. 1888.

O. Pycnia chiefly epiphyllous, gregarious, in small groups, inconspicuous, yellowish becoming brownish, depressed-globose, 128–160 μ in diameter by 91–112 μ high; ostiolar filaments rather short.

I. Aecia hypophyllous, gregarious, in crowded or annular groups 1.5–5 mm. across on discolored spots, short, cupulate, 0.2–0.3 mm. in diameter; peridium colorless, the margin recurved, erose; peridial cells rhomboidal, 23–34 μ long, the outer wall rather thick, 4–7 μ, transversely striate, the inner wall thinner, 2–3 μ, partially striate, moderately verrucose; aeciospores globoid, 18–24 by 21–29 μ; wall light-yellow or colorless, 1.5–2 μ thick, moderately verrucose.

II. Uredinia amphigenous, somewhat gregarious, in loose, sometimes annular groups 2–5 mm. across, roundish, 0.5–1 mm. in diameter, rather soon naked, cinnamon-brown, pulverulent, ruptured epidermis conspicuous; urediniospores subgloboid or broadly ellipsoid, 19-24 by 24–32 μ; wall dark-yellow, moderately thick, about 2–3 μ, evenly and rather closely echinulate with blunt conical points, the pores 6–8, scattered.

III. Telia amphigenous, solitary or somewhat gregarious, in loose, sometimes annular groups, 0.5–1 mm. or more in diameter, rather soon naked, compact, pulvinate, dark chocolate-brown or blackish, ruptured epidermis conspicuous; teliospores subglobose or ellipsoid, 18–26 by 26–39 μ, rounded or somewhat narrowed at the apex; wall chestnut-brown, 2–3 μ thick, thicker above, 7–12 μ, smooth; pedicel tinted, once to twice length of spore or more.

ON FABACEAE:
Lupinus albifrons Benth., California.
Lupinus argenteus Pursh, Colorado.
Lupinus campestris Cham. & Schlecht., Hidalgo.
Lupinus Chamissonis Eschsch., California.
Lupinus decumbens Torr., Colorado, Nebraska.
Lupinus Douglasii J. Ag., California.
Lupinus elegans H.B.K., Mexico (state).
Lupinus formosus Greene, California.
Lupinus holosericeus Nutt., Montana.
Lupinus latifolius J. Ag., California.
Lupinus laxiflorus Dougl., Wyoming.
Lupinus Losani Rose, Jalisco.
Lupinus mexicanus H.B.K., Mexico (state).
Lupinus montanus H.B.K., Hidalgo.
Lupinus parviflorus Nutt., Wyoming.
Lupinus polyphyllus Lindl., Washington.
Lupinus rivularis Dougl. (*L. cytisoides* J. Ag.)., California.
Lupinus sericeus Pursh, Idaho.
Lupinus uncinatus Schlecht., Hidalgo.
Lupinus sp., Arizona, Oregon.

TYPE LOCALITY: California, on leaves of *Lupinus*.

DISTRIBUTION: Montana and Nebraska westward to the Pacific coast, and southward through Mexico.

EXSICCATI: D. Griff. W. Am. Fungi *377*; Sydow, Ured. *857*, *1761*, *1856*, *1961*; Ellis, N. Am. Fungi *1441*; Rav. Fungi Am. *52*; Barth. Fungi Columb. *2290*.

56. **Nigredo occidentalis** (Dietel) Arthur.

Uromyces occidentalis Dietel, Hedwigia Beibl. 42: 98. 1903.
Uromyces rugosus Arth. Bot. Gaz. 39: 386. 1905.

O and I. Pycnia and aecia not seen.

II. Uredinia chiefly hypophyllous, solitary or often in annular groups 2–4 mm. or more across, roundish, 0.4–0.8 mm. in diameter, rather early naked, pulverulent, cinnamon-brown, ruptured epidermis noticeable; urediniospores broadly ellipsoid or subglobose, 16–23 by 19–29 μ; wall golden-brown, 1.5–2 μ thick, closely and bluntly echinulate, the pores 6–8, scattered.

III. Telia chiefly hypophyllous, solitary or in annular groups 3–6 mm. across, roundish

0.4–1 mm. in diameter, rather early naked, somewhat pulverulent, slightly pulvinate, chocolate-brown, ruptured epidermis not noticeable; teliospores broadly ellipsoid or obovoid, 15–19 by 19–26 μ; wall cinnamon-brown, 1.5–2 μ thick, slightly thicker at the apex, densely and rather coarsely verrucose; pedicel short, hyaline, deciduous.

ON FABACEAE:
Lupinus Douglasii J. Ag., California.
Lupinus holosericeus Nutt., Montana.
Lupinus Kingii S. Wats. (*L. Sileri* S. Wats.), Colorado.
Lupinus latifolius J. Ag., California.
Lupinus leptophyllus Benth., California.
Lupinus Lyallii A. Gray, Washington.
Lupinus parviflorus Nutt., Colorado, Utah.
Lupinus pulcherrimus Rydb., Utah.
Lupinus sp., Mexico (state).
TYPE LOCALITY: Sissons, California, on *Lupinus latifolius*.
DISTRIBUTION: Central Rocky Mountain region from Montana and Washington southward to central Mexico.
EXSICCATI: Sydow, Ured. *1763*; Garrett, Fungi Utah. *119*, *199*; Barth. N. Am. Ured. *96*; Ellis, N. Am. Fungi *1438*.

57. **Nigredo substriata** (Sydow) Arthur.

Uromyces substriatus Sydow, Ann. Myc. 4: 30. 1906.

O and I. Pycnia and aecia not seen.

II. Uredinia chiefly hypophyllous, scattered, small, rather early naked, pale cinnamon-brown, somewhat pulverulent, ruptured epidermis noticeable; urediniospores broadly ellipsoid, 19–23 by 21–29 μ; wall golden-brown, 1.5–2 μ thick, rather sparsely echinulate, the pores 6–8, scattered.

III. Telia chiefly hypophyllous, scattered, sometimes confluent, roundish, 0.5–1 mm. in diameter, early naked, pulverulent, somewhat pulvinate, dark chestnut-brown, ruptured epidermis noticeable; teliospores broadly ellipsoid or obovoid, 16–21 by 18–24 μ; wall light cinnamon-brown, rather thin, about 1.5 μ, slightly thicker at apex, moderately verrucose with elongate papillae arranged in longitudinal rows; pedicel short, hyaline, deciduous.

ON FABACEAE:
Lupinus argenteus Pursh, Colorado, Montana.
Lupinus laxiflorus Dougl., Wyoming.
Lupinus monticola Rydb., Wyoming.
Lupinus sericeus Pursh, Montana.
TYPE LOCALITY: Livingston, Montana, on *Lupinus argenteus*.
DISTRIBUTION: Central Rocky mountain region from Montana to Colorado.
EXSICCATI: Ellis & Ev. N. Am. Fungi *2226*; Clements, Crypt. Form. Colo. *539*; D. Griff. W. Am. Fungi *279*.

58. **Nigredo punctata** (Schroet.) Arthur.

Uredo Leguminosarum d Astragali α, β, γ Opiz, Seznam 151, hyponym. 1852.
Uredo acuminata Kirchner, Lotos **6**: 179. 1856. Not *Nigredo acuminata* Arth. 1906.
Uromyces punctatus Schröt. Abh. Schles. Ges. **48**: 10. 1870.
Uromyces Astragali Sacc. Mycol. Ven. Specim. 208, hyponym. 1873.
Uromyces Oxytropidis J. Kunze; Rab. Fungi Eur. *1793*, hyponym. 1874.
Trichobasis Oxytropi Peck, Bot. Gaz. **4**: 218. 1879.
Uredo Oxytropidis De-Toni, in Sacc. Syll. Fung. **7**: 855. 1888.
Uromyces Euphorbiae-Astragali Jordi, Centr. Bakt. II. Abth. 11: 790. 1904.

O. Pycnia chiefly hypophyllous, scattered, from a diffused mycelium, conspicuous, honey-yellow becoming brownish, globoid, 145–160 μ in diameter; ostiolar filaments rather long.

I. Aecia chiefly hypophyllous, from a diffused mycelium, rather evenly and extensively scattered, cupulate, 0.3–0.4 mm. in diameter; peridium colorless, the margin slightly recurved and somewhat lacerate; peridial cells rhomboidal, 10–15 μ thick, 18–25 μ long, overlapping, the outer wall rather thick, 6–9 μ, transversely striate, the inner wall thinner, about 3 μ, finely verrucose; aeciospores angular-globoid, 15–21 μ in diameter; wall colorless, thin, 1–1.5 μ, densely and finely verrucose.

ON EUPHORBIACEAE:
Euphorbia Cyparissias L. and *E. virgata* Waldst. & Kit., Europe; not yet found in America.

II. Uredinia amphigenous, scattered, roundish, 0.3–0.8 mm. in diameter, soon naked, pulverulent, cinnamon-brown, ruptured epidermis not conspicuous; urediniospores broadly

ellipsoid, 16–23 by 19–30 μ; wall light cinnamon-brown, 1.5–2 μ thick, moderately echinulate, the pores 3, 4, or often 5, scattered or oftentimes appearing approximately equatorial.

III. Telia amphigenous, scattered, roundish, equaling uredinia in size, soon naked, somewhat pulverulent, chestnut-brown, ruptured epidermis not conspicuous; teliospores subglobose or obovoid, 15–19 by 19–23 μ, usually rounded at both ends; wall chestnut-brown, moderately thin, about 1.5 μ, with a minute hyaline papilla over the germ-pore, densely and rather finely verrucose; pedicel short, hyaline.

ON FABACEAE:
Aragallus albiflorus A. Nels., Colorado, Montana.
Aragallus Lamberti (Pursh) Greene (*Oxytropis Lamberti* Pursh), Colorado, Kansas, Montana, Nebraska.
Aragallus sericeus (Nutt.) Greene (*Oxytropis sericea* Nutt.), Nebraska.
Astragalus amphioxus A. Gray (*Xylophacos amphioxus* Rydb.), Utah.
Astragalus arizonicus A. Gray, Arizona.
Astragalus Bigelovii A. Gray, Arizona.
Astragalus canadensis L. (*A. carolinianus* L.), Kansas, Nebraska, South Dakota.
Astragalus Candolleanus (H.B.K.) Sheldon (*A. triflorus* A. Gray, *Phaca Candolleana* H.B.K.), Arizona, Nevada.
Astragalus crassicarpus Nutt. (*A. caryocarpus* Ker, *Geoprumnon crassicarpum* Rydb.), Nebraska, South Dakota.
Astragalus Crotalariae (Benth.) A. Gray (*A. oocarpus* A. Gray), California.
Astragalus cyaneus A. Gray, Colorado.
? *Astragalus decumbens* (Nutt.) A. Gray, Utah.
Astragalus eucosmus B. L. Robinson (*A. elegans* Sheldon not Bunge, *Atelophragma elegans* Rydb., *Phaca elegans* Hook.), Colorado.
Astragalus glareosus Dougl. (*A. argophyllus* Nutt.), Idaho.
Astragalus Hornii A. Gray, California.
Astragalus Humboldtii A. Gray, Chihuahua.
Astragalus lentiginosus Dougl., Nevada.
Astragalus leptocarpus T. & G. (*Hamosa leptocarpa* Rydb.), Texas.
Astragalus leucopsis Torr., California.
Astragalus Menziesii A. Gray, California.
Astragalus mollissimus Torr., Colorado, Kansas, Nebraska, Texas.
Astragalus nebraskensis Bates, Nebraska.
Astragalus nitidus Dougl. (*A. adsurgens* Hook. not Pall.), Montana, Nebraska.
Astragalus Preussii A. Gray, California.
Astragalus Purshii Dougl. (*Xylophacos Purshii* Rydb.), California, Utah.
Astragalus pycnostachyus A. Gray, California.
Astragalus sulphurescens Rydb., Colorado.
Astragalus tennesseensis A. Gray (*Geoprumnon tennesseense* Rydb.), Tennessee.
Astragalus Thurberi A. Gray, Arizona.
Astragalus Tracyi Greene, Texas.
Astragalus uintensis M. E. Jones (*Xylophacos uintensis* Rydb.), Colorado.
Astragalus utahensis T. & G., Idaho, Utah.
Astragalus Wardii A. Gray, Utah.

TYPE LOCALITY: Breslau, Germany, on *Astragalus glycophyllus*.

DISTRIBUTION: Montana and South Dakota southward into northern Mexico, westward to the Pacific coast, and in one locality in Tennessee; also in Europe and northern Africa.

ILLUSTRATIONS: Centr. Bakt. II. Abth. 11: 791, *f. I–VIII*; Beitr. Krypt. Schweiz 2^2: *f. 25*.

EXSICCATI: Clements, Crypt. Form. Colo. *605*; Ellis & Ev. Fungi Columb. *1990*, *2092*; Barth. Fungi Columb. *2391*, *3494*; Barth. N. Am. Ured. *84*; Ellis & Ev. N. Am. Fungi *2257*; Sydow, Ured. *1752*, *1753*, *2000*; Carleton, Ured. Am. *47*; Garrett, Fungi Utah. *146*, *195*.

59. **Nigredo fallens** (Desmaz.) Arthur.

Uredo fallens Desmaz. Pl. Crypt. *1325*. 1843.
Trichobasis fallens Cooke, Jour. Bot. 4: 105. 1866.
Uromyces fallens Kern, Phytopathology 1: 6. 1911.

O and I. Pycnia and aecia uncertain.

II. Uredinia chiefly hypophyllous, scattered, rather early naked, roundish or oval, 0.3–0.8 mm. in diameter, pulverulent, pale cinnamon-brown, ruptured epidermis conspicuous; urediniospores broadly ellipsoid or obovate-ellipsoid, 19–23 by 22–26 μ; wall light cinnamon-brown, 1.5–2 μ thick, rather sparsely echinulate, the pores 4–6, scattered.

III. Telia chiefly hypophyllous, scattered, rather tardily naked, roundish or oval, 0.3–0.8 mm. in diameter, somewhat pulverulent, dark cinnamon-brown, ruptured epidermis conspicuous; teliospores broadly ellipsoid or obovoid, 16–20 by 20–27 μ; wall cinnamon-brown, moderately thick, 1.5–2 μ, often with an inconspicuous hyaline papilla over the germ-pore, smooth, or more usually with a few irregularly scattered, roundish warts; pedicel short, hyaline, deciduous.

ON FABACEAE:
Trifolium incarnatum L., Delaware, South Dakota.
Trifolium medium L., Nebraska, South Dakota.
Trifolium pratense L., Alabama, Colorado, Delaware, Illinois, Indiana, Iowa, Kansas, Maine, Maryland, Massachusetts, Mississippi, Missouri, Nebraska, New York, North Carolina, Ohio, Pennsylvania, South Carolina, South Dakota, Tennessee, West Virginia; British Columbia, Nova Scotia, Quebec.

TYPE LOCALITY: Lille, France, "in foliis Trifoliorum" [*Trifolium pratense*].

DISTRIBUTION: On the subgenus *Lagopus* throughout the eastern United States and Canada from the great plains to the Atlantic coast, and in one locality in the Selkirk mountains; also in Europe and Asia.

EXSICCATI: Ellis & Ev. Fungi Columb. *173, 340, 2190;* Barth. Fungi Columb. *2997;* Kellerm. Ohio Fungi *140;* Seym. & Earle, Econ. Fungi *511* (in part), *512;* D. Griff. W. Am. Fungi *92*.

60. **Nigredo Trifolii** (Hedw. f.) Arth. Résult. Sci. Congr. Bot. Vienne 344. 1906.

Puccinia Trifolii Hedw. f.; DC. Fl. Fr. **2**: 225. 1805.
Uredo Fabae Trifolii Alb. & Schw. Consp. Fung. 127. 1805.
Uredo Trifolii DC.; Poir. in Lam. Encyc. **8**: 223. 1808.
Aecidium Trifolii-repentis Cast. Obs. **1**: 33. 1842.
Uromyces Trifolii Lév. Ann. Sci. Nat. III. **8**: 371. 1847.
Trichobasis fallens Cooke, Micr. Fungi ed. 2. 225. 1870.
Uromyces Trifolii-repentis Liro, Acta Soc. Faun. Fl. Fenn. **29**[6]: 15. 1906.

O. Pycnia chiefly epiphyllous, in small groups or sometimes spread out over larger areas, not conspicuous, honey-yellow becoming reddish-brown, globoid, 100–130 μ in diameter; ostiolar filaments up to 30 μ long.

I. Aecia amphigenous, in roundish crowded groups or on the veins and petioles in elongate groups, short, cupulate, 0.2–0.3 mm. in diameter; peridium white, the margin erect or slightly recurved, finely erose; peridial cells rhomboidal, slightly overlapping, 13–15 μ broad by 18–26 μ long, the outer wall rather thick, 5–6 μ, transversely striate, smooth, the inner wall thinner, 2–3 μ, moderately verrucose; aeciospores broadly ellipsoid or somewhat angular, 15–17 by 16–21 μ; wall light-yellow, or nearly colorless, thin, about 1 μ, finely verrucose.

II. Uredinia amphigenous, scattered, oval or roundish, 0.3–0.6 mm. in diameter, rather tardily naked, pulverulent, cinnamon-brown, ruptured epidermis conspicuous; urediniospores broadly ellipsoid, 18–21 by 21–26 μ; wall golden-brown, rather thin, about 1.5 μ, rather sparsely echinulate, the pores 3 or 4, equatorial.

III. Telia chiefly hypophyllous, scattered, oval or roundish, variable in size, 0.3–0.8 mm. or more in diameter, rather tardily naked, somewhat pulverulent, chestnut-brown, ruptured epidermis conspicuous; teliospores broadly ellipsoid or obovate-ellipsoid, 13–19 by 20–29 μ; wall cinnamon-brown, rather thin, about 1.5 μ, with a small hyaline papilla over the germ-pore, smooth, or with a few, small, sparsely scattered papillae; pedicel colorless or slightly tinted, short.

ON FABACEAE:
Trifolium amabile H.B.K., Mexico (state), Veracruz.
Trifolium amphianthum T. & G., Texas.
Trifolium hybridum L., Alabama, Connecticut, Indiana, Maine, Massachusetts, Michigan, New York, South Dakota, Vermont, Washington, West Virginia.
Trifolium incarnatum L., Wisconsin.
Trifolium Logani House, Hidalgo.
Trifolium repens L., Colorado, Connecticut, District of Columbia, Illinois, Indiana, Iowa, Maine, Massachusetts, Minnesota, Montana, Nebraska, New York, North Dakota, Pennsylvania, Utah, Vermont, West Virginia, Wisconsin; Newfoundland; Jamaica.

TYPE LOCALITY: Fontenai-aux-Roses, France, on "trefle rampant" [*Trifolium repens*].

DISTRIBUTION: On the subgenus *Trifoliastrum* chiefly, from Newfoundland to Washington southward to the West Indies and central Mexico, rare in the southeastern states and on the Pacific coast; also in Europe, Asia, and Australia.

ILLUSTRATION: Beitr. Krypt. Schweiz **2**[2]: *f. 19*.

EXSICCATI: Garrett, Fungi Utah. *121;* Brenckle, Fungi Dak. *74;* Clements, Crypt. Form. Colo. *541;* D. Griff. W. Am. Fungi *266;* Ellis, N. Am. Fungi *1444;* Ellis & Ev. Fungi Columb. *2191;* Barth. Fungi Columb. *2495, 3197, 3498, 3596, 3597;* Seym. & Earle, Econ. Fungi *509a, b, 513*.

61. **Nigredo Coluteae** Arthur.

Uromyces Coluteae Arth. Bull. Torrey Club **37**: 574. 1910.

O and I. Pycnia and aecia unknown.

II. Uredinia hypophyllous, scattered, roundish, small, 0.2–0.3 mm. in diameter, soon naked, somewhat pulverulent, pale cinnamon-brown, ruptured epidermis conspicuous; urediniospores broadly ellipsoid or globoid, 18–24 by 21–27 μ; wall golden-brown, 1.5–2 μ thick, finely and rather closely echinulate, the pores 3, equatorial.

III. Telia hypophyllous, scattered, roundish, small, 0.2–0.3 mm. in diameter, soon naked, somewhat pulverulent, chestnut-brown, ruptured epidermis noticeable; teliospores broadly ellipsoid or obovoid, 15–19 by 19–23 μ; wall cinnamon-brown, rather thick, 1.5–2 μ, with a small hyaline papilla over the germ-pore, moderately and evenly verrucose; pedicels short, hyaline, deciduous.

ON FABACEAE:
Colutea arborescens L., Kansas.
TYPE LOCALITY: Meran, Austria, on *Colutea arborescens*.
DISTRIBUTION: Introduced in Kansas; common in Europe.
ILLUSTRATION: Bull. Torrey Club **37**: 575, *f. 1, A*.

62. **Nigredo Cologaniae** Arthur.

Uromyces Cologaniae Arth. Bot. Gaz. **39**: 387. 1905.

O and I. Pycnia and aecia unknown.

II. Uredinia hypophyllous, scattered, round, small, 0.3 mm. or less across, soon naked, pulverulent, pale, cinnamon-brown, ruptured epidermis barely noticeable; urediniospores globoid, 16–23 by 19–27 μ; wall pale cinnamon-brown, thin, 1.5–2 μ, evenly and minutely echinulate, the pores 3 or 4, equatorial.

III. Telia hypophyllous, scattered, round, small, about 0.3 mm. across, soon naked, pulverulent, cinnamon-brown, ruptured epidermis barely noticeable; teliospores oval or globoid, 16–20 by 18–26 μ, rounded at both ends; wall cinnamon-brown, 1.5–2 μ thick, thicker at the apex, 2–4 μ, with a very low pale umbo, closely and finely verrucose; pedicel colorless, short, fragile, mostly deciduous.

ON FABACEAE:
Cologania affinis Mart. & Gal., Veracruz.
Cologania congesta Rose, Mexico (state).
Cologania pulchella H.B.K., Michoacan.
Cologania sp., Oaxaca.
Teramnus uncinatus Sw., Porto Rico.
TYPE LOCALITY: Patzcuaro, Mexico, on *Cologania pulchella*.
DISTRIBUTION: Central and southern Mexico, and in the West Indies.

63. **Nigredo Medicaginis** (Pass.) Arthur.

Uredo Fabae Medicaginis-falcatae DC. Fl. Fr. 6: 69, hyponym. 1815.
Uromyces Medicaginis Pass.; Thüm. Herb. Myc. Oecon. *156*. 1874.
Uromyces Medicaginis-falcatae Wint. in Rab. Krypt. Fl. 1[1]: 159. 1881.
Uredo medicaginicola Speg. Anal. Mus. Nac. Buenos Aires 6: 234. 1898.
Nigredo Medicaginis-falcatae Arth. Résult. Sci. Congr. Bot. Vienne 344. 1906.

O and I. Pycnia and aecia uncertain.

II. Uredinia chiefly hypophyllous, scattered, oval or roundish, 0.2–0.5 mm. across, rather early naked, pulverulent, cinnamon-brown, ruptured epidermis conspicuous; urediniospores broadly ellipsoid or subglobose, 16–20 by 18–23 μ; wall golden-brown, 1.5–2 μ thick, finely and rather sparsely echinulate, the pores 3 or 4, equatorial.

III. Telia chiefly hypophyllous, scattered, oval or roundish, 0.3–0.6 mm. across, rather early naked, somewhat pulverulent, dark cinnamon-brown, ruptured epidermis conspicuous; teliospores subglobose or ovoid, 15–20 by 19–24 μ; wall cinnamon-brown, rather thin, about 1.5 μ, with a small papilla over the germ-pore, moderately verrucose with more or less elongate papillae arranged in evident longitudinal rows; pedicel short, hyaline, deciduous.

Pycnia and aecia of the species unknown in America; said to be on *Euphorbia Cyparissias*, *E. Gerardiana*, and *E. virgata* in Europe.

ON FABACEAE:
Medicago denticulata Willd., Louisiana.
Medicago falcata L., South Dakota.
Medicago hispida Gaertn., Louisiana.
Medicago lupulina L., California, Delaware, Massachusetts, New York, North Carolina, Ohio, Oregon, West Virginia; Ontario; Mexico (state).
Medicago sativa L., Alabama, Arizona, Colorado, Indiana, Iowa, Kansas, Louisiana, Nebraska, Ohio, South Dakota, Texas; Coahuila.
Medicago tuberculata Willd. (*M. confinis* Koch), Louisiana.

TYPE LOCALITY: Parma, Italy, on *Medicago sativa*.
DISTRIBUTION: East of the Rocky Mountains from South Dakota and Massachusetts southward to Alabama and central Mexico, and near the Pacific coast in Oregon, California, and Arizona; also in Europe, India, and South America.
ILLUSTRATION: Beitr. Krypt. Schweiz 2^2: *f. 24*.
EXSICCATI: Barth. Fungi Columb. *2494*, *3297*; Barth. N. Am. Ured. *199*; Ellis, N. Am. Fungi *234*; D. Griff. W. Am. Fungi *80*.

64. **Nigredo appendiculata** (Pers.) Arth. Résult. Sci. Congr. Bot. Vienne 343. 1906.

Uredo appendiculata Pers. Ann. Bot. Usteri **15**: 16. 1795.
Uredo appendiculata Phaseoli Pers. Ann. Bot. Usteri **15**: 17. 1795.
Puccinia Phaseoli Rebent. Prodr. Fl. Neom. 356. 1804.
Puccinia Phaseolorum Hedw. f.; DC. Fl. Fr. **2**: 224. 1805.
Uredo Phaseolorum DC.; Poir. in Lam. Ency. **8**: 221. 1808.
Uredo Phaseoli Strauss, Ann. Wett. Ges. **2**: 98. 1811.
Hypodermium (*Uromyces*) *appendiculatum* Link, Ges. Nat. Freunde Berlin Mag. **7**: 28. 1815.
Caeoma Phaseoli Nees, Syst. Pilze Schw. 16. 1816.
Caeomurus Phaseolorum S. F. Gray, Nat. Arr. Brit. Pl. **1**: 541. 1821.
Caeoma appendiculatum Schlecht. Fl. Berol. **2**: 129. 1824.
Puccinia Phaseoli-trilobi Schw. Trans. Am. Phil. Soc. II. **4**: 296. 1832.
Aecidium Phaseolorum Wallr. Fl. Crypt. Germ. **2**: 296. 1833.
Uromyces appendiculatus Fries, Summa Veg. Scand. 514. 1849. Not *U. appendiculatus* Ung. 1836.
Aecidium candidum Bon.; Rab. Fungi Eur. *188*. 1860.
Caeoma rufum Bon.; Rab. Fungi Eur. *194*. 1860.
Uromyces Phaseolorum Tul.; DeBary, Ann. Sci. Nat. IV. **20**: 80. 1863.
Uromyces Phaseoli Wint. in Rab. Krypt. Fl. 1^1: 157. 1881.
? *Uredo Pamparum* Speg. Anal. Soc. Ci. Argent. **12**: 74. 1881.
Uredo rufa Speg. Anal. Soc. Ci. Argent. **17**: 124. 1884.
Uromyces obscurus Dietel & Holway; Holway, Bot. Gaz. **24**: 24. 1897.
Caeomurus appendiculatus Kuntze, Rev. Gen. 3^3: 449. 1898.
Caeomurus Phaseoli Arth. Proc. Ind. Acad. Sci. **1898**: 181. 1899.
Uromyces punctiformis Sydow, Ured. *1513*. 1901.
Puccinia Dolichi Arth. Bull. Torrey Club **33**: 28. 1906.
Uredo Dolichi Arth. Bull. Torrey Club **33**: 513. 1906.

O. Pycnia epiphyllous, in small groups, rather large, papillose, honey-yellow, globoid, 100–125 μ in diameter.

I. Aecia hypophyllous, in small often annular groups, 2–3 mm. across, short, cupulate; peridium white, margin spreading or somewhat revolute, lacerate; peridial cells rhomboidal or linear-rhomboidal, somewhat overlapping, 10–13 μ broad by 24–30 μ long, the outer wall moderately thick, 4–5 μ, transversely striate, the inner wall thinner, 2–3 μ, verrucose; aeciospores ellipsoid or oblong-ellipsoid, 16–20 by 20–26 μ; wall colorless, thin, 1–1.5 μ, minutely and closely verrucose.

II. Uredinia amphigenous, scattered, roundish, small, about 0.5 mm. or less in diameter, soon naked, cinnamon-brown, somewhat pulverulent, ruptured epidermis evident; urediniospores ellipsoid, obovoid, or subglobose, 16–23 by 20–33 μ; wall light golden-brown, rather thin, 1–1.5 μ, sharply and sparsely echinulate, the pores 2, rarely 3, equatorial.

III. Telia amphigenous, scattered, roundish, about 0.5 mm. in diameter, early naked, blackish-brown, somewhat pulverulent, ruptured epidermis evident; teliospores broadly ellipsoid or subglobose, 20–26 by 24–32 μ, rounded or obtuse above, usually rounded below; wall dark chestnut-brown, rather thick, 3–3.5 μ, with a large hemispherical hyaline apiculus above making the wall 6–10 μ thick, smooth or with a few, small, sparsely scattered hyaline papillae; pedicel hyaline, about as long as the spore.

ON FABACEAE:
Dolichos Lablab L. (*Lablab vulgaris* Savi), Jamaica.
Dolichos reticulatus Hochst., Cuba.
Phaseolus adenanthus G. Meyer, Porto Rico.
Phaseolus anisotrichus Schlecht., Oaxaca, Mexico (state), Michoacan.
Phaseolus atropurpureus Moc. & Sessé, Guerrero; Guatemala.
Phaseolus coccineus Jacq., Jalisco, Mexico (state), Michoacan.
Phaseolus disophyllus Benth., Jalisco.
Phaseolus lunatus L., Mississippi, South Carolina.
Phaseolus obvallatus Schlecht., Mexico (state).
Phaseolus polystachyus (L.) B.S.P. (*P. perennis* Walt.), West Virginia.
Phaseolus retusus Benth., Hidalgo.
Phaseolus sinuatus Nutt., Florida.

Phaseolus vulgaris L. (*P. nanus* L.), Alabama, Arkansas, Delaware, Illinois, Indiana, Iowa, Kansas, Louisiana, Maine, Massachusetts, Minnesota, Mississippi, Nebraska, New Jersey, New York, North Carolina, North Dakota, Ohio, South Carolina, Texas, Vermont, West Virginia, Wisconsin; Jalisco, Mexico (state), Morelos; Cuba; Porto Rico.
Phaseolus sp., Jamaica.
Strophostyles helvola (L.) Britton (*S. angulosa* Ell., *Phaseolus diversifolius* Pers., *P. helvolus* L.), Alabama, Delaware, Illinois, Indiana, Iowa, Kansas, Maryland, Mississippi, Missouri, Nebraska, New Jersey, New York, North Carolina, Ohio, Oklahoma, Rhode Island, South Carolina, West Virginia, Wisconsin.
Strophostyles pauciflora (Benth.) S. Wats. (*Phaseolus pauciflorus* Benth.), Indiana, Kansas, Mississippi, Missouri, Nebraska.
Strophostyles sp., New Mexico.
Vigna repens (L.) Kuntze, Florida.
Vigna strobilophora B. L. Robinson, Jalisco.
Vigna sinensis (L.) Endl., Florida, Indiana, Iowa, Texas.

TYPE LOCALITY: Europe, on *Phaseolus vulgaris*.

DISTRIBUTION: Maine to North Dakota southward to Florida and southern Mexico, and in the West Indies; also in Europe, Africa, northeastern Asia, Japan, Australia, and South America.

ILLUSTRATIONS: Beitr. Krypt. Schweiz **2**[2]: *f. 16*; McAlpine, Rusts Austr. *pl. 42, f. 306*.

EXSICCATI: Ellis & Ev. Fungi Columb. *172, 172b, 1893, 1989, 2180*; Barth. Fungi Columb. *2891, 3089, 3290*; Barth. N. Am. Ured. *86, 184*; Rab.-Wint.-Paz. Fungi Eur. *3930a, b, c*; Rav. Fungi Am. *275, 495*; Rav. Fungi Car. **2**: *94*; Kellerm. Ohio Fungi *199*; Brenckle, Fungi Dak. *87*; Sydow, Ured. *1513, 1801, 2001*.

65. **Nigredo Clitoriae** Arthur.

Uromyces Clitoriae Arth. Bot. Gaz. **39**: 389. 1905.

O and I. Pycnia and aecia unknown.

II. Uredinia hypophyllous, crowded in small groups, small, somewhat pulverulent, brownish; urediniospores triangular-globoid or obovoid, 24–27 by 27–29 μ; wall golden-brown, 1.5–2 μ thick, evenly and sparsely echinulate, the pores 2, approximately equatorial.

III. Telia hypophyllous, small, round, scattered, dark cinnamon-brown, soon naked, ruptured epidermis inconspicuous; teliospores ellipsoid, 17–24 by 22–30 μ; wall chestnut-brown, 2–2.5 μ thick, thicker at apex, 3–5 μ, with a broad semihyaline cap, finely and closely verrucose above, becoming nearly or quite smooth below; pedicel colorless, delicate, less than the length of the spore.

ON FABACEAE:
Clitoria mexicana Link, Veracruz.
TYPE LOCALITY: Jalapa, state of Veracruz, Mexico, on *Clitoria mexicana*.
DISTRIBUTION: Known only from the type locality.

66. **Nigredo Neurocarpi** (Dietel) Arthur.

Uromyces Neurocarpi Dietel, Hedwigia **34**: 292. 1895.
Uromyces rostratus P. Henn. Hedwigia **35**: 227. 1896.
Uromyces insularis Arth. Bull. Torrey Club **33**: 515. 1906.

O and I. Pycnia and aecia unknown.

II. Uredinia amphigenous, scattered, small, roundish, 0.1–0.4 mm. across, soon naked, somewhat pulverulent, dark cinnamon-brown, ruptured epidermis noticeable; urediniospores globoid or depressed-globoid, 19–23 by 23–25 μ; wall golden-brown, about 1 μ thick, sparsely echinulate with conical points about 3 μ apart, the pores 2, slightly below the equator.

III. Telia amphigenous, scattered, round or oval, 0.2–0.8 mm. across, soon naked, light cinnamon-brown, ruptured epidermis noticeable; teliospores broadly lanceolate, rounded or obtuse at both ends, 15–18 by 29–39 μ; wall smooth, golden-yellow, thin, about 1 μ, apex usually bearing a hyaline umbo, 3–7 μ; pedicel hyaline, slender, about length of spore.

ON FABACEAE:
Clitoria cajanifolia (Presl) Benth. (*Neurocarpum cajanifolium* Presl), Porto Rico.
TYPE LOCALITY: Bahia, Brazil, on *Neurocarpum cajanifolium*.
DISTRIBUTION: West Indies; also in South America.

67. **Nigredo Dolicholi** Arthur.

Uromyces Dolicholi Arth. Bull. Torrey Club **33**: 27. 1906.

O and I. Pycnia and aecia unknown.

II. Uredinia amphigenous, scattered, round, 0.2–0.5 mm. across, soon naked, pale cinnamon-brown, pulverulent, ruptured epidermis inconspicuous; urediniospores globose, 18–21 μ in diameter; wall cinnamon-brown, 1.5–2 μ thick, minutely and closely echinulate, the pores 4, equatorial.

III. Telia amphigenous, scattered, round, 0.2–0.5 mm. across, soon naked, cinnamon-brown, pulverulent, ruptured epidermis inconspicuous; teliospores oblong or oblong-lanceolate, 10–15 by 26–32 μ, narrowed toward both ends; wall pale golden-brown, smooth, thin, 1 μ or less, thicker at apex, 3–6 μ, with a nearly colorless umbo; pedicel slender, half length of spore, nearly colorless.

ON FABACEAE:
Dolicholus texanus (T. & G.) Vail (*Rhynchosia texana* T. & G.), Texas.
TYPE LOCALITY: San Angelo, Texas, on *Dolicholus texanus*.
DISTRIBUTION: Known only from the type locality; or possibly also in South America.

68. **Nigredo Galphimiae** (Dietel & Holway) Arthur.

Uromyces Galphimiae Dietel & Holway; Holway, Bot. Gaz. **24**: 25. 1897.

O. Pycnia epiphyllous, gregarious, inconspicuous, punctiform, golden-brown, globoid, 110–130 μ in diameter.

I. Aecia hypophyllous, loosely gregarious, roundish, 0.3–0.6 mm. in diameter, brownish-yellow, deep-seated, ruptured epidermis inconspicuous; peridium rather firm; peridial cells oblong, about 40 μ long, overlapping, the outer wall rather thick, 4–5 μ, transversely striate, the inner wall somewhat thinner, moderately verrucose; aeciospores broadly ellipsoid or obovate-globoid, 21–24 by 27–32 μ; wall colorless, 1.5–2 μ thick, closely and strongly verrucose.

II. Uredinia chiefly hypophyllous, numerous, scattered or somewhat gregarious, round, 0.2–0.5 mm. across, tardily naked, cinnamon-brown, ruptured epidermis noticeable; urediniospores globoid or ellipsoid, 23–28 by 27–31 μ; wall pale golden-brown, rather thin, 1–1.5 μ, strongly echinulate with conical points, the pores obscure, apparently 2, equatorial.

III. Telia amphigenous, scattered, roundish, 0.2–0.5 mm. across, tardily naked, blackish, pulverulent, ruptured epidermis conspicuous; teliospores globoid, ellipsoid or obovate, 24–29 by 32–43 μ, obtuse at apex; wall chestnut-brown, thick, 4–6 μ, thicker at apex, 9–12 μ, including a conspicuous lighter umbo, finely and evenly verrucose; pedicel hyaline, one to one and a half times length of spore.

ON MALPIGHIACEAE:
Thryallis Humboldtiana (Bartl.) Kuntze (*Galphimia Humboldtiana* Bartl.), Jalisco.
TYPE LOCALITY: Guadalajara, Mexico, on *Galphimia Humboldtiana*.
DISTRIBUTION: Western Mexico.
ILLUSTRATION: Sydow, Monog. Ured. **2**: *pl. 5, f. 88.*
EXSICCATI: Sydow, Ured. *2006*.

69. **Nigredo proëminens** (DC.) Arthur.

Uredo proëminens DC. Fl. Fr. **2**: 235. 1805.
Aecidium Euphorbiarum Chamaesycis Duby, Bot. Gall. **2**: 907. 1830.
Caeoma (*Aecidium*) *Euphorbiae-hypericifoliae* Schw. Trans. Am. Phil. Soc. II. **4**: 293. 1832.
Aecidium (*Caeoma*) *Euphorbiae-hypericifoliae* Schw. Trans. Am. Phil. Soc. II. **4**: 309. 1832.
Trichobasis euphorbiaecola Berk. & Curt. Jour. Linn. Soc. **10**: 357. 1869.
Uromyces Euphorbiae Cooke & Peck; Peck, Ann. Rep. N. Y. State Mus. **25**: 90. 1873.
Uromyces proëminens Pass.; Rab. Fungi Eur. *1795*. 1873.
Uromyces Chamaesycis Sacc. Atti Accad. Sci. Padova **24**: 199. 1874; Hedwigia **14**: 192. 1875.
Uromyces Myristica Berk. & Curt.; Berk. Grevillea **3**: 57. 1874.
Uromyces pulvinatus Kalchb. & Cooke, Grevillea **9**: 21. 1880.
Uromyces Euphorbiae minor Arth. Bull. Minn. Acad. Sci. 2^2: 28. 1883.
Uredo euphorbicola De-Toni, in Sacc. Syll. Fung. **7**: 847. 1888.
Uromyces Macounianus Ellis & Ev. Proc. Phila. Acad. **1893**: 155. 1893.
Uromyces Euphorbiae subcircinatus Ellis & Ev. N. Am. Fungi *3045*. 1894.
Uromyces Ellisianus P. Henn. Hedwigia **37**: 269. 1898.
Caeomurus Euphorbiae Kuntze, Rev. Gen. 3^3: 450. 1898.
Nigredo Euphorbiae-hypericifoliae Arth. Résult. Sci. Congr. Bot. Vienne 343. 1906.
Uromyces euphorbiicola Tranz. Ann. Myc. **8**: 8. 1910.
Uromyces Poinsettiae Tranz. Ann. Myc. **8**: 11. 1910.

O. Pycnia hypophyllous, widely scattered among the aecia, rather few, punctiform, honey-yellow becoming brownish, globoid, 130–145 μ in diameter; ostiolar filaments up to 65 μ long.

I. Aecia chiefly hypophyllous, from an unlimited mycelium, usually occupying all of the under surface of the affected leaves, evenly and often densely scattered, short, cupulate, 0.3–0.4 mm. in diameter; peridium somewhat recurved, finely lacerate; peridial cells rhomboidal, somewhat overlapping, 13–19 μ broad by 18–25 μ long, the outer wall rather thick, 4–7 μ, transversely striate, smooth, the inner wall thinner, about 3 μ, somewhat striate, finely verrucose; aeciospores globoid or broadly ellipsoid, 12–16 by 15–19 μ; wall pale-yellow or colorless, thin, 1 μ, finely and densely verrucose.

II. Uredinia amphigenous, scattered or sometimes in annular or crowded groups, roundish, 0.4–1 mm. across, early naked, pulvinate, pulverulent, cinnamon-brown, ruptured epidermis not conspicuous; urediniospores globoid or broadly ellipsoid, 15–20 by 19–23 μ; wall pale golden-brown, rather thin, about 1.5–2 μ, moderately and sparsely echinulate, the pores 3–6, scattered.

III. Telia amphigenous, scattered or sometimes in annular groups, roundish, 0.4–1 mm. across, early naked, pulvinate, somewhat pulverulent, dark chocolate-brown, ruptured epidermis not conspicuous; teliospores broadly ellipsoid or obovoid, 15–18 by 18–26 μ, usually rounded at both ends; wall cinnamon-brown, rather thin, 1.5 μ, with a lighter-colored, flattish or conical papilla over the germ-pore, moderately verrucose with papillae scattered or sometimes arranged in more or less evident longitudinal rows; pedicel hyaline, short, deciduous.

A cosmopolitan and somewhat variable species, which has been shown by cultures to possess strongly marked races, treated by some authors as species. These races, so far as known, are four and correspond to the host genera as follows: *a*, *Poinsettia*, *b*, *Dichrophyllum*, *c*, the smaller-leaved and more prostrate species of *Chamaesyce*, and *d*, the larger-leaved and more upright species of *Chamaesyce*.

ON EUPHORBIACEAE:

Adenopetalum gramineum (Jacq.) Arth. (*Euphorbia graminea* Jacq.), Hidalgo.
Chamaesyce adenoptera (Bertol.) Small (*Euphorbia adenoptera* Bertol.), Guatemala, Nicaragua.
Chamaesyce albomarginata (T. & G.) Small (*Euphorbia albomarginata* T. & G.), California.
Chamaesyce arizonica (Engelm.) Arth. (*Euphorbia arizonica* Engelm.), Arizona.
Chamaesyce brasiliensis (Lam.) Small (*Euphorbia brasiliensis* Lam.), Guatemala.
Chamaesyce Fendleri (T. & G.) Small (*Euphorbia Fendleri* T. & G.), Arizona, Utah.
Chamaesyce Geyeri (Engelm.) Small (*Euphorbia Geyeri* Engelm.), Illinois, Mississippi, Nebraska.
Chamaesyce glyptosperma (Engelm.) Small (*Euphorbia glyptosperma* Engelm.), Colorado, Iowa, Minnesota, Nebraska, North Dakota, Oregon, South Dakota.
Chamaesyce hirsuta (Torr.) Arth. (*Euphorbia hirsuta* Wiegand), New York.
Chamaesyce hirta (L.) Millsp. (*Euphorbia hirta* L., *E. pilulifera* L.), Florida; Jamaica; Porto Rico.
Chamaesyce humistrata (Engelm.) Small (*Euphorbia humistrata* Engelm.), Illinois, Indiana, Iowa, Missouri, Nebraska, Ohio.
Chamaesyce hypericifolia (L.) Millsp. (*Euphorbia hypericifolia* L.), District of Columbia, Florida, Indiana, Iowa, Missouri, Nebraska, New York, North Carolina, Ohio, Pennsylvania, West Virginia; Bahamas.
Chamaesyce hyssopifolia (L.) Small (*Euphorbia hyssopifolia* L.), Florida.
Chamaesyce lasiocarpa (Klotzsch) Arth. (*Euphorbia lasiocarpa* Klotzsch), Guatemala.
Chamaesyce maculata (L.) Small (*Euphorbia maculata* L.), Connecticut, Delaware, Florida, Indiana, Iowa, Kansas, Massachusetts, Minnesota, Nebraska, New Jersey, South Carolina, Texas, Wisconsin.
Chamaesyce lata (Engelm.) Small (*Euphorbia lata* Engelm.), Kansas, Texas.
Chamaesyce Nuttallii (Engelm.) Small (*Euphorbia Nuttallii* Engelm.), Kansas.
Chamaesyce petaloidea (Engelm.) Small (*Euphorbia petaloidea* Engelm.), Nebraska, South Dakota, Texas.
Chamaesyce pilosula (Engelm.) Arth. (*Euphorbia pilosula* Engelm.), Oaxaca.
Chamaesyce polygonifolia (L.) Small (*Euphorbia polygonifolia* L.), Illinois.
Chamaesyce Preslii (Guss.) Arth. (*Euphorbia Preslii* Guss.), Arkansas, Delaware, Illinois, Indiana, Iowa, Kansas, Minnesota, Mississippi, Missouri, Nebraska, New Jersey, New York, North Carolina, Ohio, Pennsylvania, Texas.
Chamaesyce potosina (Fernald) Arth. (*Euphorbia potosina* Fernald), Hidalgo.
Chamaesyce prostrata (Ait.) Small (*Euphorbia prostrata* Ait.), Mississippi; Mexico (state); Bahamas; Jamaica; St. Croix.
Chamaesyce serpens (H.B.K.) Small (*Euphorbia serpens* H.B.K.), Kansas, Louisiana, Nebraska; Mexico (state); Jamaica.
Chamaesyce serpyllifolia (Pers.) Small (*C. erecta* Lunell, *Euphorbia serpyllifolia* Pers.), Arizona, California, Colorado, Iowa, Montana, Nevada, New Mexico, North Dakota, South Dakota, Texas, Utah, Washington; British Columbia.
Chamaesyce Tracyi Small, Mississippi.
Dichrophyllum bicolor (Engelm. & Gray) Kl. & Garcke (*Euphorbia bicolor* Engelm. & Gray), Texas.

Dichrophyllum marginatum (Pursh) Kl. & Garcke (*Euphorbia marginata* Pursh), Colorado, Iowa, Kansas, Nebraska, South Dakota, Texas.
Poinsettia barbellata (Engelm.) Small (*Euphorbia barbellata* Engelm.), New Mexico.
Poinsettia dentata (Michx.) Small (*Euphorbia dentata* Michx.), Colorado, Illinois, Indiana, Iowa, Kansas, Missouri, Nebraska, Ohio, Texas, Utah, West Virginia; Hidalgo, Michoacan.
Poinsettia heterophylla (L.) Kl. & Garcke (*Euphorbia heterophylla* L.), Indiana, Iowa, Kansas; Morelos; Bahamas; Cuba; Jamaica.
Poinsettia strigosa (H. & A.) Arth. (*Euphorbia strigosa* H. & A.), Guerrero, Jalisco, Mexico (state), Veracruz.
Zygophyllidium biformis (S. Wats.) Arth. (*Euphorbia biformis* S. Wats.), Jalisco.
Zygophyllidium hexagonum (Nutt.) Small (*Euphorbia hexagona* Nutt.), Nebraska.

TYPE LOCALITY: France, on *Euphorbia* sp.

DISTRIBUTION: Connecticut to Minnesota and Vancouver Island, and southward throughout the United States, Mexico, Central America, and the West Indies; also in South America, Europe, Asia, and Africa.

ILLUSTRATIONS: Ber. Deuts. Bot. Ges. 9: *pl. 14, f. 1–11, 23–29*; 11: *pl. 4, f. 1–15*.

EXSICCATI: Carleton, Ured. Am. *18*; Ellis & Ev. N. Am. Fungi *1820, 3045, 3046*; Ellis & Ev. Fungi Columb. *337, 338, 1503, 1602, 1694, 1791, 1792, 1991, 1992, 2093, 2094, 2183*; Barth. Fungi Columb. *2695, 2893, 2989, 3090, 3292, 3293, 3394, 3594*; Barth. N. Am. Ured. *88, 89, 188*; Sydow, Ured. *1051, 1152, 1153, 1256, 1352, 1503, 1853*; Kellerm. Ohio Fungi *36, 98, 160*; D. Griff. W. Am. Fungi *79, 352*; Clements, Crypt. Form. Colo. *529, 531*; Seym. & Earle, Econ. Fungi *383, 384, 385a, b, 386a, b*; Brenckle, Fungi Dak. *71, 119*; Garrett, Fungi Utah. *148, 175*; Thüm. Myc. Univ. *947*; Ellis, N. Am. Fungi *236*; Rav. Fungi Am. *484, 492*; Rab.-Wint.-Paz. Fungi Eur. *3925a, b*; Rab.-Wint. Fungi Eur. *3009*; Rab.-Paz. Fungi Eur. *4232*.

70. **Nigredo Gouaniae** (Kern) Arthur.

Uromyces Gouaniae Kern, Mycologia 3: 290. 1911.

O and I. Pycnia and aecia unknown.

II. Uredinia hypophyllous, scattered, roundish, small, 0.1–0.3 mm. in diameter, punctiform, chestnut-brown, ruptured epidermis inconspicuous; paraphyses not very numerous, encircling the sori, clavate or cylindrical, 10–16 by 30–40 μ, somewhat incurved, the wall colorless, thin, about 1 μ; urediniospores obovoid or broadly ellipsoid, 18–19 by 21–26 μ; wall light cinnamon-brown, 1.5–2 μ thick, evenly and sparsely echinulate, the pores 2, occasionally 3, superequatorial.

III. Telia hypophyllous, scattered, resembling the uredinia in shape and size, dark chestnut-brown; paraphyses none; teliospores broadly ellipsoid or ovoid, 18–23 by 26–29 μ, rounded or obtuse above, rounded or somewhat narrowed below; wall chestnut-brown, moderately thick, 2–2.5 μ, with a slightly paler umbo making the wall 4–5 μ thick above; pedicel tinted, once to twice length of spore.

ON RHAMNACEAE:
Gouania domingensis L., Guatemala.

TYPE LOCALITY: Laguna, Depart. Amatitlan, Guatemala, on *Gouania domingensis*.

DISTRIBUTION: Known only from the type locality.

71. **Nigredo Hyperici-frondosi** (Schw.) Arth. Résult. Sci. Congr. Bot. Vienne 344. 1906.

Aecidium Hyperici-frondosi Schw. Schr. Nat. Ges. Leipzig 1: 68. 1822.
Caeoma hypericatum Link, in Willd. Sp. Pl. 6^2: 58. 1825.
Uredo Hyperici Spreng. Syst. Veg. 4: 572. 1827.
Caeoma (Uredo) Hyperici Schw. Trans. Am. Phil. Soc. II. 4: 291. 1832.
Aecidium oblongum Bon. Abh. Nat. Ges. Halle 5: 212. 1860.
Uromyces triquetrus Cooke, Proc. Portland Soc. Nat. Hist. 1: 184. 1862.
Uromyces Hyperici M. A. Curt. Cat. Pl. N. Car. 123. 1867.
Trichobasis Hyperici W. Gerard, Bull. Torrey Club 4: 47. 1873.
Aecidium minutissimum W. Gerard, Bull. Torrey Club 5: 40. 1874.
Aecidium Hypericorum Berk. & Curt.; Berk. Grevillea 3: 61. 1874.
Uromyces Hyperici-frondosi Arth. Bull. Minn. Acad. Nat. Sci. 2^2: 15. 1883.
Uromyces pachycephalus Neger, Anal. Univ. Chile 93: 785. 1896.
Caeomurus Hyperici Kuntze, Rev. Gen. 3^3: 450. 1898.
Caeomurus Hyperici-frondosi Arth. Proc. Ind. Acad. Sci. 1898: 180. 1899.

O. Pycnia amphigenous, in small groups, crowded, punctiform, honey-yellow becoming blackish, globoid, 90–115 μ in diameter; ostiolar filaments 30–80 μ long.

I. Aecia hypophyllous, crowded in small groups 1–2 mm. or more across, on discolored spots, sometimes solitary, cupulate or sometimes short-cylindrical, small, about 0.1–0.2 mm. in diameter; peridium white or yellowish, the margin spreading or revolute, erose; peridial cells rhomboidal, 26–32 μ long, the outer wall thick, 7–9 μ, transversely striate, the

inner wall thinner, 3–4 μ, striate and moderately verrucose; aeciospores globoid or broadly ellipsoid, 14–23 by 16–26 μ; wall colorless or pale-yellow, about 1.5 μ thick, very minutely verrucose.

II. Uredinia chiefly hypophyllous, scattered, roundish, small, 0.1–0.2 mm. across, rather tardily naked, pulverulent, cinnamon-brown, ruptured epidermis evident; urediniospores broadly ellipsoid or subglobose, 15–21 by 19–27 μ; wall pale cinnamon-brown, rather thin, 1–1.5 μ, minutely and sparsely echinulate, the pores minute, 3, equatorial.

III. Telia chiefly hypophyllous, scattered, roundish or angular, 0.3–0.8 mm. across, sometimes confluent, rather tardily naked, pulvinate, blackish-brown, ruptured epidermis conspicuous; teliospores ellipsoid, obovate or oblong, 12–18 by 16–32 μ, obtuse or rounded at the apex, obtuse or narrowed at the base; wall chestnut-brown, rather thin, 1–1.5 μ, much thicker at the apex, 7–10 μ, smooth; pedicel tinted, firm, about length of spore.

ON HYPERICACEAE:

Ascyrum hypericoides L. (*A. Crux-Andreae* L. 1763), Mississippi.
Hypericum Ascyron L. (*H. pyramidatum* Ait.), Iowa, Minnesota, Missouri, Wisconsin.
Hypericum aureum Bart. (*H. frondosum* Michx.), North Carolina.
Hypericum boreale (Britton) Bickn., Maine, Pennsylvania.
Hypericum canadense L. (*H. canadense minimum* Choisy), Maine, Wisconsin.
Hypericum ellipticum Hook., New York.
Hypericum Kalmianum L., Illinois; Ontario.
Hypericum majus (A. Gray) Britton (*H. canadense majus* A. Gray), Kansas, Maine, Massachusetts, Vermont.
Hypericum mutilum L. (*Ascyrum Crux-Andreae* L. 1753), Alabama, Connecticut, Delaware, District of Columbia, Illinois, Indiana, Iowa, Maine, Massachusetts, Mississippi, New York, North Carolina, Ohio, South Carolina, Vermont, Virginia, West Virginia; Veracruz.
Hypericum opacum T. & G., Florida.
Hypericum perforatum L., Maine, New York.
Hypericum prolificum L., West Virginia; Ontario.
Hypericum punctatum Lam. (*H. corymbosum* Muhl., *H. maculatum* Walt.), Connecticut, Massachusetts, Missouri, New York, Wisconsin.
Hypericum submontanum Rose, Hidalgo.
Triadenum virginicum (L.) Raf. (*Hypericum virginicum* L., *Elodea virginica* Nutt., *E. campanulata* Pursh), Alabama, Florida, Georgia, Illinois, Indiana, Iowa, Maine, Massachusetts, Michigan, Missouri, New Jersey, New York, Wisconsin; Nova Scotia, Ontario, Quebec.
Triadenum petiolatum (Walt.) Britton (*Elodea petiolata* Pursh, *Hypericum petiolatum* Walt.), Illinois, Missouri.

TYPE LOCALITY: Narrows of Yadkin, North Carolina, on *Hypericum frondosum*.

DISTRIBUTION: Nova Scotia to Minnesota, and southward to Florida, Mississippi, and southern Mexico; also in South America.

EXSICCATI: Ellis, N. Am. Fungi *231a, b;* Ellis & Ev. N. Am. Fungi *2209, 2994;* Ellis & Ev. Fungi Columb. *479;* Barth. Fungi Columb. *3093;* Shear, N. Y. Fungi *78;* Seym. & Earle, Econ. Fungi *265a, b;* Sydow, Ured. *1156, 1157;* Rav. Fungi Am. *794, 795;* Rab.-Wint. Fungi Eur. *3308*.

72. **Nigredo plumbaria** (Peck) Arth. Résult. Sci. Congr. Bot. Vienne 344. 1906.

Uromyces plumbarius Peck, Bot. Gaz. **4**: 127. 1879.
Aecidium gaurinum Peck, Bot. Gaz. **4**: 218. 1879.
Trichobasis gaurina Peck, Bot. Gaz. **4**: 218. 1879.
Uromyces Oenotherae Burrill, Bot. Gaz. **9**: 187. 1884.
Uredo gaurina De-Toni, in Sacc. Syll. Fung. **7**: 848. 1888.
Uromyces gaurinus Snyder, Proc. Ind. Acad. Sci. **1896**: 222. 1897.
Caeomurus Oenotherae Kuntze, Rev. Gen. **3**^{3}: 450. 1898.
Caeomurus plumbarius Kuntze, Rev. Gen. **3**^{3}: 450. 1898.
Caeomurus gaurinus Arth. Proc. Ind. Acad. Sci. **1898**: 180. 1899.
Uromyces Fremontii Sydow, Ann. Myc. **4**: 29. 1906.

O. Pycnia chiefly hypophyllous, rather few, loosely scattered, punctiform, honey-yellow becoming brownish, flattened-globoid, 128–144 μ in diameter by 82–112 μ high.

I. Aecia chiefly hypophyllous, numerous, rather evenly and thickly effused over large areas, often occupying all of the under surface of a leaf, cupulate, short, 0.2–0.4 mm. in diameter; peridium whitish, the margin spreading or somewhat recurved, irregularly lacerate; peridial cells rhomboidal, 12–16 by 20–24 μ, the outer wall rather thick, 6–7 μ, striate, the inner wall thinner, 3–4 μ, moderately verrucose; aeciospores globoid, 12–16 by 14–18 μ; wall colorless, thin, 1–1.5 μ, finely verrucose.

II. Uredinia amphigenous, scattered, roundish, about 0.4–0.7 mm. across, rather early naked, pulverulent, dark cinnamon-brown, ruptured epidermis noticeable; urediniospores

broadly ellipsoid or obovoid, 15–23 by 20–26 μ; wall golden-brown, 1.5–2 μ thick, finely and rather sparsely echinulate, the pores 2 or 3, approximately equatorial.

III. Telia amphigenous, scattered, roundish or oval, 0.5–1 mm. or more across, rather early naked, somewhat pulverulent, slightly pulvinate, chocolate-brown, ruptured epidermis conspicuous; teliospores obovate or oblong, 15–23 by 22–35 μ, roundish, obtuse, or less often acute above, usually narrowed below; wall light to dark cinnamon-brown, moderately thick, 2–2.5 μ, much thicker at the apex, 5–10 μ, smooth; pedicel somewhat tinted next to the spore, fragile, about one and a half times length of spore, usually broken away and appearing short.

ON ONAGRACEAE:

Gaura biennis L., Indiana, New York, Ohio.
Gaura coccinea Pursh, Colorado, Montana, South Dakota, Texas.
Gaura glabra Lehm., Colorado, Montana.
Gaura marginata Lehm., Colorado, Kansas, Montana, Nebraska.
Gaura parviflora Dougl., Kansas, Nebraska.
Gaura sinuata Nutt., Texas.
Gaura villosa Torr., Kansas.
Kneiffia linifolia (Nutt.) Spach (*Oenothera linifolia* Nutt.), Illinois, Missouri, Texas.
Lavauxia brachycarpa (A. Gray) Britton (*Oenothera brachycarpa* A. Gray), Nebraska.
Megapterium Fremontii (S. Wats.) Britton (*Oenothera Fremontii* S. Wats.), Kansas.
Oenothera laciniata Hill (*O. sinuata* L.), Alabama, Delaware, Mississippi, Nebraska, North Carolina, South Carolina.
Onagra biennis (L.) Scop. (*Oenothera biennis* L.), Illinois, Indiana, Iowa, Maine, Massachusetts, Nebraska, New Hampshire, New Jersey, Ohio, Pennsylvania, Rhode Island, South Dakota, Virginia, West Virginia, Wisconsin.
Pachylophus caespitosus (Nutt.) Raim. (*Oenothera caespitosa* Nutt.), Colorado, Nevada, Utah, Wyoming.
Pachylophus hirsutus Rydb., Wyoming.
Pachylophus macroglottis Rydb., Idaho.
Pachylophus marginatus (Nutt.) Rydb. (*Oenothera idahoensis* Mulf.), Idaho, Oregon, Utah.
Pachylophus montanus (Nutt.) A. Nels. (*Oenothera montana* Nutt.), Oregon, Wyoming.

TYPE LOCALITY: Colorado, on *Oenothera caespitosa*.

DISTRIBUTION: Maine to South Carolina and eastern Mississippi, and westward to central Oregon and Nevada.

EXSICCATI: Ellis, N. Am. Fungi *226*; Ellis & Ev. N. Am. Fungi *1858*, *1866*, *2894*; Ellis & Ev. Fungi Columb. *1388*, *1793*, *1994*, *2184*; Barth. Fungi Columb. *2594*; Clements, Crypt. Form. Colo. *533*; Garrett, Fungi Utah. *117*, *150*, *200*; D. Griff. W. Am. Fungi *40*; Seym. & Earle, Econ. Fungi *B29*, *281a*, *b*; Sydow, Ured. *1802*.

73. **Nigredo Limonii** (DC.) Arth. Résult. Sci. Congr. Bot. Vienne 344. 1906.

Puccinia Limonii DC. Fl. Fr. **2**: 595. 1805.
Uredo Statices Desmaz. Pl. Crypt. *128*. 1826.
Aecidium Statices Desmaz. Pl. Crypt. *132*. 1826.
Caeoma Statices Rudolphi, Linnaea **4**: 510. 1829.
Uredo Limonii Duby, Bot. Gall. **2**: 897. 1830.
Aecidium Limonii Duby, Bot. Gall. **2**: 904. 1830.
Uromyces Statices Berk. & Curt. Proc. Am. Acad. 4: 126. 1858.
Uromyces Limonii Lév.; Cooke, Micr. Fungi 211. 1865.
Caeomurus Limonii Kuntze, Rev. Gen. **3**³: 450. 1898.

O. Pycnia amphigenous, loosely grouped, or between the aecia, inconspicuous, honey-yellow, globoid, 120–160 μ in diameter; ostiolar filaments 50–65 μ long.

I. Aecia amphigenous, usually in orbicular groups, 3–8 mm. across, somewhat crowded, cylindrical; peridium white, erect, erose or irregularly torn; peridial cells rhomboidal, 28–35 μ long, the walls transversely striate, the outer rather thick, 5–6 μ, the inner thinner, 3–4 μ, moderately verrucose; aeciospores irregularly globoid, 18–23 by 20–28 μ; wall pale-yellow, thin, 1–1.5 μ, very minutely and closely verrucose.

II. Uredinia amphigenous, scattered, roundish, 0.5–1 mm. across, tardily naked, cinnamon-brown, pulverulent; urediniospores ellipsoid or nearly globoid, 23–27 by 27–34 μ; wall cinnamon-brown, thick, 1.5–2.5 μ, very closely and conspicuously verrucose with smal papillae, the pores 2 or 3, equatorial.

III. Telia amphigenous, scattered, roundish, large, 1–2 mm. across, rather tardily naked, chocolate-brown, firm, ruptured epidermis evident and somewhat overarching; teliospores obovate or ellipsoid, 19–24 by 27–35 μ, obtuse or rounded above, narrowed below; wall chestnut-brown, smooth, rather thick, 1.5–2.5 μ, thicker at apex, 5–10 μ; pedicel somewhat colored, once to twice length of spore, persistent.

ON ARMERIACEAE:
Limonium californicum (Boiss.) Small, California.
Limonium carolinianum (Walt.) Britton (*Statice Limonium carolinianum* A. Gray), Maine, Massachusetts, Mississippi, New Jersey, New York; New Brunswick, Nova Scotia.
Statice Armeria L. (*Armeria vulgaris* Willd.), California.
TYPE LOCALITY: Coast of LaManche, France, on *Statice Limonium*.
DISTRIBUTION: Almost the entire eastern and western coasts of North America north of Mexico; also in Europe, Asia, and northern Africa.
EXSICCATI: Ellis, N. Am. Fungi *241, 242;* Ellis & Ev. Fungi Columb. *649, 658;* Barth. Fungi Columb. *2294, 3096;* Barth. N. Am. Ured. *95*.

74. **Nigredo (?) speciosa** (Holway) Arthur.

Uromyces speciosus Holway, Ann. Myc. 3: 23. 1905.

O and I. Pycnia and aecia unknown.

II. Uredinia not seen; urediniospores in the telia, globoid or oblong-globoid, 19–24 by 26–35 μ; wall rather thick, 1.5–2.5 μ, cinnamon-brown, rather sparsely and inconspicuously echinulate, the pores 3–6, scattered, sometimes appearing approximately equatorial.

III. Telia amphigenous, round, scattered, 0.5–1 mm. in diameter, rather early naked, pulverulent, chocolate-brown; teliospores ellipsoid or subglobose, somewhat angular, 15–19 by 21–29 μ, rounded at both ends; wall chestnut-brown, thin, 1 μ, minutely and closely verrucose, thicker at the apex, 2.5–3.5 μ; pedicel colorless, fragile, soon breaking away and appearing short.

ON GENTIANACEAE:
Frasera macrophylla Greene, New Mexico.
Frasera stenosepala Rydb., Colorado.
TYPE LOCALITY: Cloudcroft, New Mexico, on *Frasera macrophylla*.
DISTRIBUTION: In the foothills of the Rocky Mountains from northern Colorado to southern New Mexico.
EXSICCATI: Clements, Crypt. Form. Colo. *132;* Barth. Fungi Columb. *2598;* Barth. N. Am. Ured. *198;* Sydow, Ured. *2012*.

75. **Nigredo Gentianae** Arthur.

Uromyces Gentianae Arth. Bot. Gaz. 16: 227. 1891.

O and I. Pycnia and aecia unknown.

II. Uredinia amphigenous, numerous, scattered, roundish or oblong, 0.2–1 mm. across, rather early naked, pulverulent, pulvinate, light cinnamon-brown, ruptured epidermis conspicuous; urediniospores broadly ellipsoid or globoid, 16–18 by 18–23 μ; wall light golden-brown, rather thin, 1–1.5 μ, finely and inconspicuously echinulate, the pores 4, equatorial.

III. Telia amphigenous, not readily distinguishable from the uredinia, roundish, 0.2–0.5 mm. across, rather tardily naked, pulverulent, pulvinate, cinnamon-brown, ruptured epidermis noticeable; teliospores broadly ellipsoid, 15–18 by 18–21 μ, wall golden-brown, about 1.5 μ thick, with a semi-hyaline cap above making the apex 2–3 μ thick, finely and closely verrucose; pedicel colorless, rather stout, about one-half the length of the spore.

ON GENTIANACEAE:
Amarella Hartwegii (Benth.) Arth. (*Gentiana Hartwegii* Benth.), Hidalgo.
Amarella mexicana (Griseb.) Arth. (*Gentiana mexicana* Griseb.), Durango.
Amarella occidentalis (A. Gray) Greene (*Gentiana quinqueflora occidentalis* A. Gray, *G. quinquefolia occidentalis* Hitchc.), Iowa.
Amarella propinqua (Richardson) Greene (*Gentiana propinqua* Richardson), Vermont.
Amarella strictiflora (Rydb.) Greene (*Gentiana acuta strictiflora* Rydb., *G. strictiflora* A. Nels.), Colorado, Nevada, Washington.
TYPE LOCALITY: Decorah, Iowa, on *Gentiana quinquefolia occidentalis*.
DISTRIBUTION: Rare and local in highlands of the northern and western United States and Mexico.
EXSICCATI: Sydow, Ured. *1587;* Barth. N. Am. Ured. *385*.

76. **Nigredo (?) Howei** (Peck) Arthur.

Trichobasis Howei Peck, Ann. Rep. N. Y. State Mus. **23**: 58. 1873.
Uromyces Asclepiades Cooke, Grevillea **5**: 152. 1877.
Uromyces Howei Peck, Ann. Rep. N. Y. State Mus. **30**: 75. 1879.
Uromyces Demetrianus Paz.; Rab.-Wint.-Paz. Fungi Eur. *4037*. 1895.
Caeomurus Howei Kuntze, Rev. Gen. 3^3: 450. 1898.

O and I. Pycnia and aecia unknown.

II. Uredinia hypophyllous, scattered, roundish, 0.5 mm. across, early naked, pulverulent, cinnamon-brown, ruptured epidermis evident; urediniospores globoid, 18–25 by 23–28 μ; wall golden-brown, thin, 1–1.5 μ, evenly echinulate, the pores 4, equatorial.

III. Telia hypophyllous, thickly scattered, roundish, 0.5 mm. across, early naked, pulverulent, light chestnut-brown, ruptured epidermis noticeable; teliospores broadly ellipsoid or globoid, 18–23 by 20–30 μ, rounded or somewhat obtuse at both ends; wall chestnut-brown, rather thin, 1.5 μ, slightly thicker above owing to the presence of a small semi-hyaline papilla, finely and closely verrucose; pedicel colorless, fragile, short.

ON ASCLEPIADACEAE:
Asclepias amplexicaulis J. E. Smith (*A. obtusifolia* Michx.), West Virginia.
Asclepias arenaria Torr., Nebraska.
Asclepias Curassavica L., Porto Rico.
Asclepias decumbens L. (*A. tuberosa decumbens* Pursh), Florida.
Asclepias incarnata L., Indiana, Iowa, Missouri, Pennsylvania, West Virginia, Wisconsin; Ontario.
Asclepias latifolia (Torr.) Raf., Texas.
Asclepias phytolaccoides Pursh, Illinois, South Dakota.
Asclepias pulchra Ehrh. (*A. incarnata pulchra* Pers.), Delaware, Illinois.
Asclepias quadrifolia Jacq., Ohio.
Asclepias Rolfsii Britton, Florida.
Asclepias speciosa Torr., Kansas.
Asclepias syriaca L. (*A. Cornuti* Decaisne), Delaware, District of Columbia, Illinois, Indiana, Iowa, Kansas, Kentucky, Massachusetts, Michigan, Missouri, Nebraska, New Jersey, New York, Ohio, Pennsylvania, Virginia, West Virginia; Ontario.
Asclepias tuberosa L., Iowa, Kansas.
Asclepiodora decumbens (Nutt.) A. Gray, Texas.
Asclepiodora viridis (Walt.) A. Gray, Kansas.
Ibatia muricata (L.) Decaisne (*Gonolobus maritimus* R. Br.), St. Croix.
Vincetoxicum gonocarpos Walt. (*Gonolobus macrophyllus* Michx.), West Virginia.

TYPE LOCALITY: North Greenbush, New York, on *Asclepias Cornuti*.

DISTRIBUTION: Northern United States and southern Canada east of the Rocky Mountains, and locally in Florida, Texas, and the West Indies.

EXSICCATI: Ellis, N. Am. Fungi *235*; Ellis & Ev. Fungi Columb. *648*, *1696*, *1896*, *2185*, *2186*; Barth. Fungi Columb. *3294*, *3295*; Barth. N. Am. Ured. *92*, *192*, *388*; D. Griff. W. Am. Fungi *392*; Kellerm. Ohio Fungi *100*; Rab.-Wint.-Paz. Fungi Eur. *3927*, *4037*; Seym. & Earle, Econ. Fungi *328*, *329*, *330*; Sydow, Ured. *255*, *1403*; Thüm. Myc. Univ. *2235*.

77. **Nigredo Solani** (Dietel & Holway) Arthur.

Uromyces Solani Dietel & Holway; Holway, Bot. Gaz. 24: 24. 1897.

O and I. Pycnia and aecia unknown.

II. Uredinia hypophyllous, scattered, roundish, 0.3–0.5 mm. across, tardily naked, pulverulent, pulvinate, golden-brown, ruptured epidermis noticeable; urediniospores obovate or ellipsoid, 18–21 by 24–32 μ; wall golden-yellow, thin, 1–1.5 μ, rather sparsely and strongly echinulate, the pores 2, opposite, equatorial.

III. Telia hypophyllous, few, scattered, roundish, 0.3–0.5 mm. across, tardily naked, compact, pulvinate, chestnut-brown, ruptured epidermis noticeable; teliospores ellipsoid or obovate-ellipsoid, 10–16 by 29–42 μ, rounded or narrowed at apex, usually narrowed below; wall light cinnamon-brown, thin, 1 μ, thickened at apex, 6–10 μ, smooth; pedicel tinted, about once the length of spore.

ON SOLANACEAE:
Solanum appendiculatum H. & B., Mexico (state), Morelos.
TYPE LOCALITY: Cuernavaca, Mexico, on *Solanum appendiculatum*.
DISTRIBUTION: South central plateau of Mexico.

78. **Nigredo (?) Ruelliae** (Holway) Arthur.

Uromyces Ruelliae Holway, Ann. Myc. 2: 394. 1904.
Uredo Beloperonis Arth. Bull. Torrey Club 37: 576. 1910.

O and I. Pycnia and aecia unknown.

II. Uredinia chiefly hypophyllous, numerous, scattered, sometimes crowded, roundish or oblong, 0.1–0.3 mm. across, tardily naked, pulverulent, chestnut-brown, ruptured epidermis conspicuous; urediniospores obovate or ellipsoid, 15–23 by 21–29 μ; wall golden-yellow, 1.5–2.5 μ thick, rather sparsely and strongly echinulate, the pores indistinct, 2, equatorial.

III. Telia chiefly epiphyllous, numerous, scattered, roundish, 0.1–0.3 mm. across, tardily naked, pulverulent, chocolate-brown or blackish, ruptured epidermis conspicuous; teliospores broadly ellipsoid, often angular, 20–32 by 30–40 μ; wall chocolate-brown, thick, 3–4 μ, thickened at apex, 7–9 μ, coarsely verrucose: pedicel colorless, rather thick, once to once and a half length of spore.

ON ACANTHACEAE:
Beloperone californica Benth., California; Lower California.
Ruellia sp., Morelos, San Luis Potosi.
TYPE LOCALITY: Cardenas, Mexico, on *Ruellia* sp.
DISTRIBUTION: Southern California southward to central Mexico.
ILLUSTRATION: Sydow, Monog. Ured. **2**: *pl. 2, f. 25*.

79. **Nigredo Bouvardiae** (Sydow) Arthur.

Uromyces Bouvardiae Sydow, Ann. Myc. **1**: 16. 1903.

O. Pycnia amphigenous, few, in groups 0.2–0.4 mm. across, honey-yellow, becoming brownish, depressed-globoid, 70–170 μ in diameter by 60–120 μ high; ostiolar filaments about 50 μ long.

I. Aecia chiefly hypophyllous, gregarious, in orbicular groups 0.7–2 mm. across; peridium not seen; peridial cells rhomboidal, 35–50 μ long, the outer wall rather thick, 5–7 μ, transversely striate, the inner wall thick, 7–9 μ, verrucose; aeciospores broadly ellipsoid or subglobose, 19–23 by 23–27 μ; wall colorless, thin, 1–1.5 μ, finely verrucose.

II. Uredinia chiefly epiphyllous, scattered, roundish or oval, 0.2–0.8 mm. across, rather soon naked, pulverulent, cinnamon-brown, ruptured epidermis conspicuous; urediniospores broadly ellipsoid or obovoid, 19–26 by 22–34 μ; wall golden-brown, 1.5–2.5 μ thick, sparsely and sharply echinulate, the pores 2, rarely 3, equatorial.

III. Telia chiefly epiphyllous, scattered, roundish or oval, 0.3–1 mm. across, rather early naked, pulverulent, blackish, ruptured epidermis noticeable; teliospores broadly ellipsoid or subglobose, 29–35 by 34–48 μ, usually rounded both above and below; wall chocolate-brown, thick, 5–8 μ, with a broad, low, semi-hyaline umbo making the wall 9–12 μ thick above, rather finely verrucose; pedicel colorless, about twice length of the spore, 8–12 μ in diameter next to the spore, the lower part considerably roughened and very slightly swollen, in some specimens only slightly roughened and swollen up to 25 μ in diameter.

ON RUBIACEAE:
Bouvardia hirtella H.B.K., Michoacan.
Bouvardia leiantha Benth., Oaxaca; Guatemala.
Bouvardia versicolor Ker, Jalisco.
Bouvardia sp., Morelos.
TYPE LOCALITY: Jumaytepeque, Depart. Santa Rosa, Guatemala, on *Bouvardia leiantha*.
DISTRIBUTION: From central Mexico southward into Guatemala.
EXSICCATI: Vesterg. Micr. Rar. Sel. *1132*; Barth. N. Am. Ured. *186, 382*.

80. **Nigredo Spermacoces** (Schw.) Arthur.

Puccinia Spermacoces Schw. Schr. Nat. Ges. Leipzig **1**: 74. 1822.
Caeoma Spermacoces Link, in Willd. Sp. Pl. **6**^{2}: 21. 1825.
Uromyces Spermacoces M. A. Curt. Cat. Pl. N. Car. 123. 1867.
Aecidium Diodiae Burrill, Bull. Ill. Lab. Nat. Hist. **2**: 228. 1885.

O. Pycnia epiphyllous, few, gregarious, inconspicuous, yellowish, becoming darker with age, globoid, 120–140 μ; ostiolar filaments apparently rather short.

I. Aecia hypophyllous, crowded in irregular groups 1–2.5 mm. across, short, cupulate, 0.2–0.3 mm. in diameter; peridium colorless, erect, the margin lacerate; peridial cells rhomboidal, 13–19 by 26–34 μ, somewhat overlapping, the outer wall 4–6 μ thick, transversely striate, the inner wall 3–5 μ thick, rather coarsely verrucose; aeciospores globoid, 21–26 by 21–28 μ; wall colorless, 1–1.5 μ, inconspicuously verrucose.

II. Uredinia chiefly epiphyllous, numerous, scattered, roundish, 0.2–0.5 mm. across, tardily naked, pulverulent, light cinnamon-brown, the overarching epidermis ruptured by an uneven slit; urediniospores broadly ellipsoid, 18–24 by 26–32 μ; wall golden-brown, 1–2 μ, rather finely echinulate, the pores 2, opposite, equatorial.

III. Telia amphigenous and caulicolous, numerous, scattered, crowded and confluent on stems, roundish or oval, 0.2–1 mm. across, rather early naked, compact, pulvinate, blackish, ruptured epidermis at first conspicuous, later disappearing; teliospores broadly ellipsoid, 19–27 by 29–37 μ; wall dark chestnut-brown, thick, 2–3 μ, with a lighter-colored broad cap making the wall at the apex 6–10 μ thick, smooth; pedicel light-yellow, usually persistent, uniform, about twice the length of the spore.

ON RUBIACEAE:
Diodia teres Walt. (*Spermacoce diodina* Michx.), Arkansas, Delaware, District of Columbia, Florida, Georgia, Illinois, Kansas, Mississippi, Missouri, New Jersey, North Carolina, South Carolina, Tennessee, Texas, West Virginia.
TYPE LOCALITY: North Carolina, on *Spermacoce* sp.
DISTRIBUTION: New Jersey to Kansas and southward to Florida and Texas.
EXSICCATI: Ellis, N. Am. Fungi *1070*; Ellis & Ev. Fungi Columb. *477*, *1704*; Barth. Fungi Columb. *2697*, *2899*; Rab.-Wint.-Paz. Fungi Eur. *3932a*, *b*; Rav. Fungi Am. *50*; Thüm. Myc. Univ. *242*; Seym. & Earle, Econ. Fungi *288*, *289a*, *b*.

81. **Nigredo Helleriana** Arthur.

Uromyces Hellerianus Arth. Bull. Torrey Club **31**: 2. 1904.

O and I. Pycnia and aecia unknown.

II. Uredinia hypophyllous, round, 0.3–0.5 mm. across, early naked, pulverulent, dark cinnamon-brown, ruptured epidermis inconspicuous; urediniospores globoid, sometimes triangular-globoid, 16–23 by 19–26 μ; wall cinnamon-brown, thin, 1–1.5 μ, finely and sparsely echinulate, the pores 2, below the equator.

III. Telia hypophyllous, round, 0.2–0.7 mm. across, early naked, pulverulent, pulvinate, dark chestnut-brown, ruptured epidermis inconspicuous; teliospores globoid to ovoid, 21–24 by 27–36 μ, rounded at both ends; wall smooth, chestnut-brown, thick, 3 μ, the apex with a prominent, hyaline umbo, 7–11 μ; pedicel one half to once the length of spore, very delicate, colorless.

ON CUCURBITACEAE:
Cayaponia racemosa (Sw.) Cogn., Guatemala; Porto Rico.
TYPE LOCALITY: Near Ponce, Porto Rico, on *Cayaponia racemosa*.
DISTRIBUTION: West Indies and Central America.

82. **Nigredo Martinii** (Farl.) Arth. Résult. Sci. Congr. Bot. Vienne 344. 1906.

Uromyces Martinii Farl. Proc. Am. Acad. **18**: 78. 1883.

O. Pycnia epiphyllous, crowded in small groups, punctiform, golden-brown, rather noticeable, globoid, 130–150 μ broad; ostiolar filaments long, about 75 μ.

I. Aecia hypophyllous, crowded in small orbicular groups, at first bright-orange; peridium broad, cupulate, the margin erect, erose; peridial cells linear-rhomboidal, 25–30 μ long, the outer and inner walls of about equal thickness, 2–3 μ, the inner finely verrucose; aeciospores globoid or elliptical-globoid, 15–22 by 18–24 μ; wall pale-yellowish, thin, 1–1.5 μ, closely and strongly verrucose.

II. Uredinia amphigenous, evenly scattered, round, 0.5 mm. across, early naked, pulverulent, dark cinnamon-brown, ruptured epidermis noticeable; urediniospores obovate-globoid, 18–21 by 19–23 μ; wall pale cinnamon-brown, thin, 1–1.5 μ, moderately and inconspicuously echinulate, the pores 2, equatorial.

III. Telia amphigenous, scattered, round, 0.5 mm. across, soon naked, somewhat pulverulent, chocolate-brown, ruptured epidermis inconspicuous; teliospores globoid, 20–26 by 23–29 μ; wall light chestnut-brown, thick, 2.5–3 μ, the apex much thicker, 7–9 μ, with a more or less evident semi-hyaline umbo, moderately and indistinctly verrucose; pedicel colorless, slender, once the length of spore, or less.

ON CARDUACEAE:
Melanthera nivea (L.) Small (*M. hastata* Michx.), Florida.
Melanthera parvifolia Small, Florida.
TYPE LOCALITY: Florida, on *Melanthera hastata*.
DISTRIBUTION: Peninsula and keys of Florida.
EXSICCATI: Ellis, N. Am. Fungi *1067*, *1068*; Rab.-Wint.-Paz. Fungi Eur. *3722*, *3723*.

83. **Nigredo cucullata** (Sydow) Arth. Résult. Sci. Congr. Bot. Vienne 343. 1906.

Uromyces cucullatus Sydow, Ann. Myc. **2**: 349. 1904.

O. Pycnia epiphyllous, crowded in small groups, subepidermal, honey-yellow becoming brownish, flattened-globoid, 80–100 μ in diameter; ostiolar filaments about 50 μ long.

I. Aecia hypophyllous, crowded in small groups; peridium cylindrical, deeply lacerate; peridial cells linear-rhomboidal, 12–15 μ broad by 29–35 μ long, the outer wall 4–6 μ, transversely striate, smooth, the inner wall 3 μ, evenly and moderately verrucose; aeciospores globoid or oblong-globoid, 19–24 by 22–26 μ; wall pale-yellowish, thin, 1 μ, closely and prominently verrucose.

II. Uredinia at first epiphyllous, becoming amphigenous, scattered, small, 0.2–0.3 mm. across, roundish, early naked, light cinnamon-brown, pulverulent, ruptured epidermis inconspicuous, urediniospores obovate-globoid, 19–23 by 21–24 μ; wall pale cinnamon-brown, thin, about 1.5 μ, moderately and sharply echinulate, the pores 2, equatorial.

III. Telia chiefly epiphyllous, scattered or sometimes gregarious and more or less confluent, small, 0.3–1 mm. across, roundish, early naked, somewhat pulverulent, blackish-brown, ruptured epidermis inconspicuous; teliospores globoid, 23–26 by 24–33 μ, often semi-opaque; wall dark chestnut-brown, sparsely and coarsely verrucose, thick, 4–5 μ, the apex much thicker, 9–12 μ, with a broad semi-hyaline umbo; pedicel colorless, firm, slender, 4 μ broad, twice the length of spore, or longer.

ON CARDUACEAE:
Perymenium Berlandieri DC., Mexico (state).
Perymenium discolor Schrad., Oaxaca.
Perymenium Mendezii DC., Hidalgo.
Perymenium verbesinoides DC., Morelos.
Zexmenia aurantiaca Klatt, Costa Rica.
Zexmenia sp., Guerrero.
TYPE LOCALITY: Costa Rica, on *Zexmenia aurantiaca*.
DISTRIBUTION: Central Mexico southward through Central America.
EXSICCATI: Barth. N. Am. Ured. *87*, *288*, *383*.

31. **DICAEOMA** S. F. Gray, Nat. Arr. Brit. Pl. 1: 541. 1821.

Puccinia Link, in Willd. Sp. Pl. 6²: 67. 1825. Not *Puccinia* Willd. 1787, nor Pers. 1794.
Solenodonta Cast. Cat. Pl. Mars. 202. 1845.
Trichobasis Lév. in Orb. Dict. Hist. Nat. **12**: 785. 1848.
Ceratitium Rab. Bot. Zeit. 9: 451. 1851.
Cutomyces Thuem. Jor. Sci. Lisboa **6**: 239. 1878.
Rostrupia Lagerh. Jour. de Bot. **3**: 188. 1889.
Jackya Bubák, Oesterr. Bot. Zeits. **52**: 42. 1902.

The genus *Dicaeoma* is not separable from *Nigredo* by any important morphological or physiological character. As here treated it is distinguished from that genus by the possession of teliospores having more than one cell, and even this distinction sometimes must be arbitrarily interpreted. The genus is retained partly for convenience in systematizing the large number of species and partly to conform with usage.

Cycle of development includes pycnia, aecia, uredinia, and telia, with distinct alternating phases; autoecious and heteroecious. Pycnia and other sori subepidermal.

Pycnia deep-seated, usually globoid or flask-shaped, with ostiolar filaments.

Aecia erumpent, cupulate, cylindrical, or rarely somewhat indefinite. Peridium rarely wanting, sometimes evanescent, usually firm, colorless, dehiscent by apical rupture, the margins lacerate or erose, erect, spreading, or recurved. Aeciospores catenulate, globoid or ellipsoid, often angular; wall colorless, verrucose.

Uredinia erumpent, definite, without peridium, and without paraphyses (except in a few species). Urediniospores borne singly on pedicels, globoid, ellipsoid, or obovoid; wall colored, echinulate or rarely verrucose, the pores two to several (very rarely one), variously arranged.

Telia erumpent or long covered by the epidermis. Teliospores two-celled, or rarely with more than two cells; wall colored, firm, smooth, or verrucosely or spinosely sculptured, the pores one in each cell, apical or somewhat depressed in the upper cell, in the lower cell somewhere between the septum and the pedicel.

Type species, *Dicaeoma Persicariae* S. F. Gray (on *Persicaria amphibia*).

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25[3]: 173–261. (Geraniales:) Rutaceae, Surianaceae, Simaroubaceae, Burseraceae.

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